TECHNOLOGY DEPT

Telephone ENGINEER and MANAGEMENT

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DETROIT

APRIL 1946

featuring

BETTER CONSTRUCTION for BETTER SERVICE

CONSTRUCTION COSTS and PLANT ACCOUNTING

Editorial Index on page 12

THE COVER PICTURE—

THE MAGAZINE OF THE TELEPHONE INDUSTRY

MANUFACTURERS OF TELEPHONE

TIME TO CALL LEICH . . . .

Telephone men know from experience that good equipment pays dividends. "Any old" pliers or just "some" wire won't do.

That's why Leich gets the call. Here at Leich are the finest in supplies and construction materials for every spring construction need. Every item is job-proved, every one made of the best available materials to the high standards set by the independent industry.

Here also, telephone men buy with complete confidence because they have learned that the Leich guarantee gives them full protection. Yes sir, it's spring, and it's time to get the plant in tip-top shape. *May we help you.*

Leich Sales Corporation, 427 West Randolph Street, Chicago 6, Illinois

JOSLYN
KLEIN
MILLERS FALLS
RELIABLE
KESTER
EVEREADY
AMERICAN BEAUTY
ONE TOO GOOD—
Amertel
TELEPHONE AND TELEGRAPH WIRE
AMERICAN STEEL & WIRE COMPANY
CHURCHILL
BURGESS
BAY-O-VAC
SEYMOUR SMITH
LENZ
BARTLETT
W. N. MATTHEWS
UNIQUE
GREENLEE
KENNICOTT
LEACH (OSHKOSH)

SWITCHBOARDS AND RELATED APPARATUS SINCE 1907

KELLOGG AND PHI

A Sensat
FM

Now . . . An Entirely New Conception of FM Mobile Equipment

- Advanced F. M. Detector using new Philco F. M. 1000 Tube gives vastly improved adjacent channel attenuation and interference-free communication.
- Uniform volume level from the weakest signal to the strongest signal.
- Advanced Phase Modulator provides high percentage modulation capabilities at all voice frequencies with minimum distortion.
- Distortion-free over-modulation limiter.
- Plug-in chassis permits quick maintenance service to the customer.
- Very low standby power drain.
- Unexcelled performance over a wide range of temperature and humidity.
- Easily adaptable to various power sources.
- Rugged shock-mounted housing provides for single or double units to fit any type installation.

LOCAL AND LONG DISTANCE TRUCKS AUTOMOBILES AND TAXI CABS MOTOR BUSES YACHT LIMBE

ILCO ANNOUNCE

ational New Mobile
Radio-Telephone

FOR THE INDEPENDENT FIELD

Now, Independent telephone companies can provide a service once considered impossible . . . can give operators of moving vehicles the advantages of telephone facilities . . . can extend their own areas of operation to points once regarded as too remote . . . can profit by engineering's latest and greatest contribution to communications—FM mobile radio-telephone!

The combined engineering talents of Kellogg and Philco have created new and really sensational features for this equipment. Read the highlights described at the left. See how these advantages can place you out in front in this great new service field.

More details on this tremendous stride forward will be forthcoming soon . . . ***watch for them!***

Manufactured by PHILCO

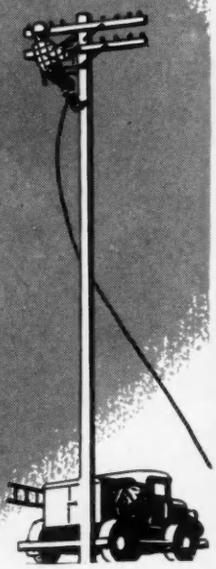
Distributed Exclusively To the Independent Telephone Field by

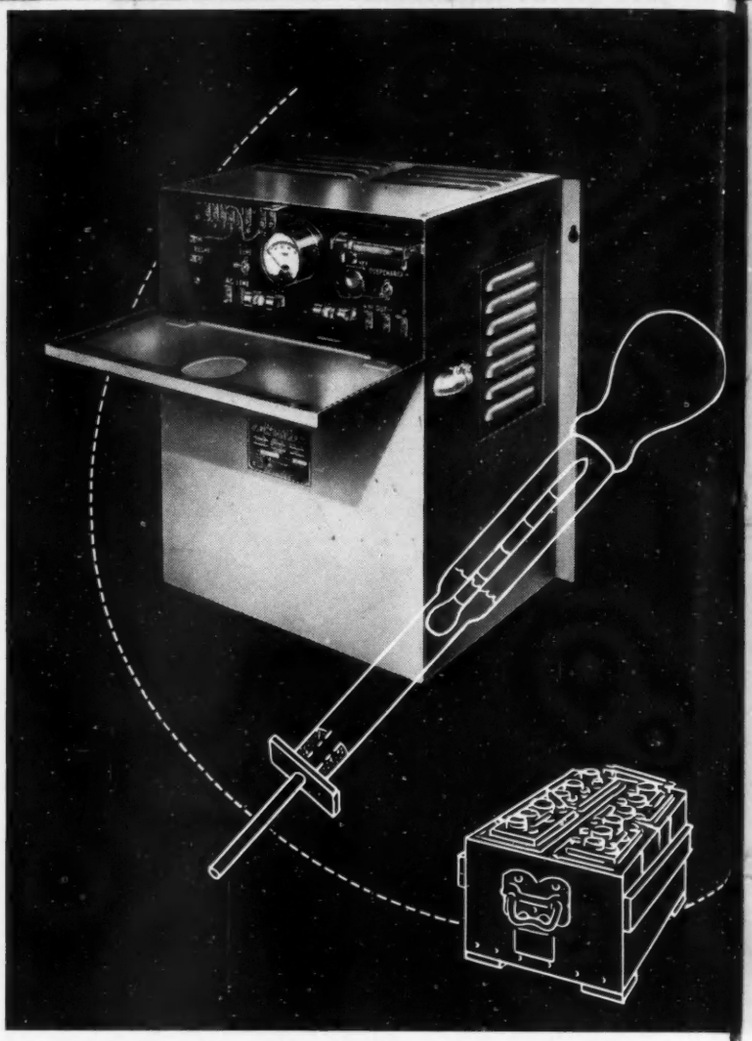
KELLOGG SWITCHBOARD & SUPPLY CO.

6650 SOUTH CICERO AVENUE **CHICAGO 38, ILLINOIS**

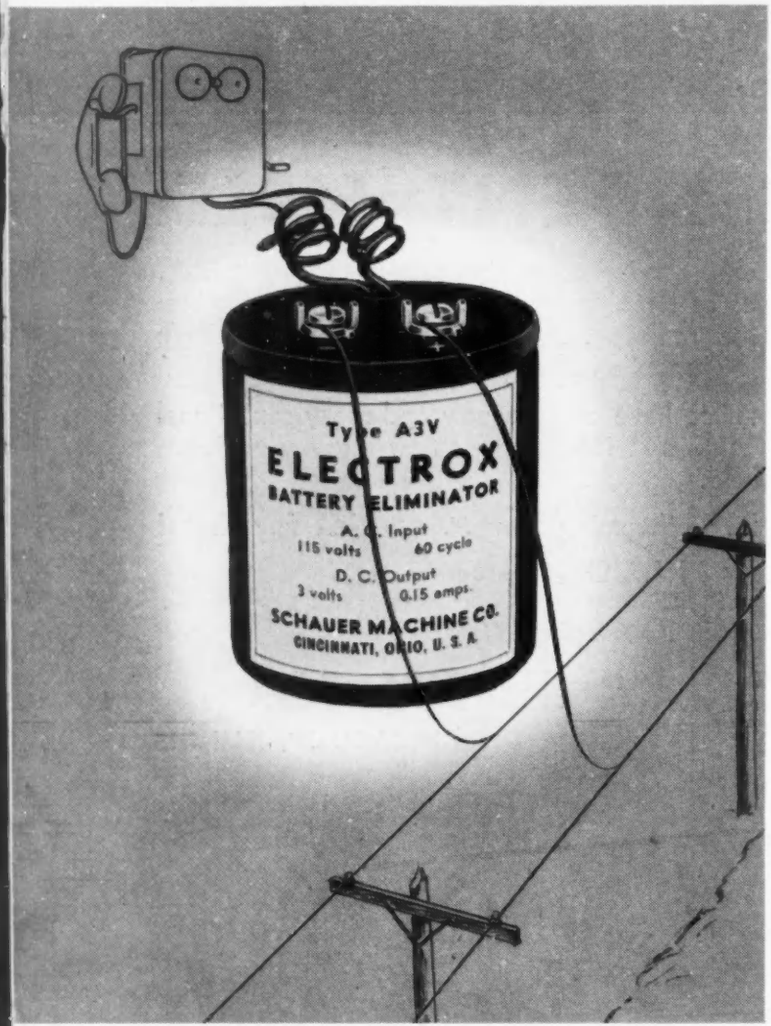
The Satisfaction Lasts When You Buy Products

Recommended and Guaranteed by KELLOGG





Never Over, Never Under. The RectiChargeR automatic method of charging keeps batteries fully charged at all times and ends operating trouble caused by under- or over-charging. That's why this RAYTHEON MANUFACTURING CO. unit is so popular with telephone men. It's a sure way to keep batteries "healthy", and assure maximum life.



Eliminate Costly Service Trips necessary to replace worn-out dry cells by installing the Electrox A3V Battery Eliminator. This SCHAUFR MACHINE CO. unit provides smooth, noiseless current for the operation of one magneto telephone and replaces the two dry cells usually used. Operates from 110 volt, 60 cycle lighting circuit. It is compact, self-contained, easy to install.

There's three-way satisfaction when you concentrate purchases of line supply and construction materials at a single, responsible source: (1) The *quality* is right—all products are backed by the famous Kellogg DOUBLE GUARANTEE; (2) The service is right—orders are intelligently handled by experienced people; (3) *Delivery* is right—orders are shipped from the nearest of over 50 strategically located distribution points.

KELLOGG SWITCHBOARD & SUPPLY COMPANY

Factory and General Offices: 6650 S. Cicero Avenue, Chicago 38

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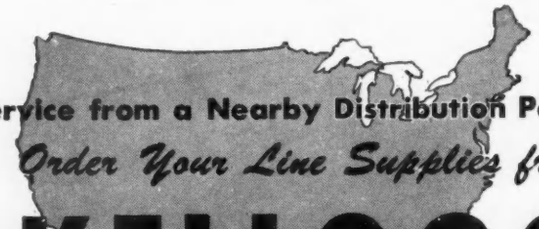
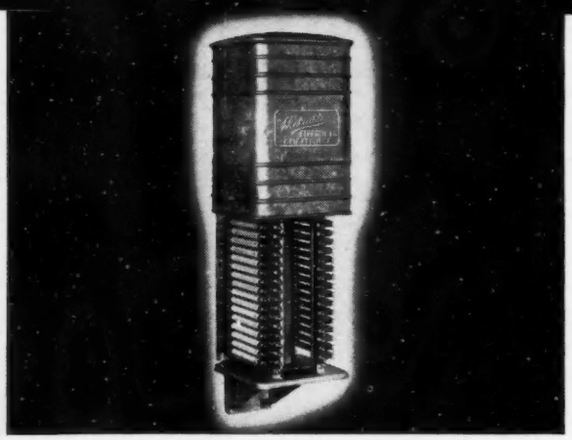


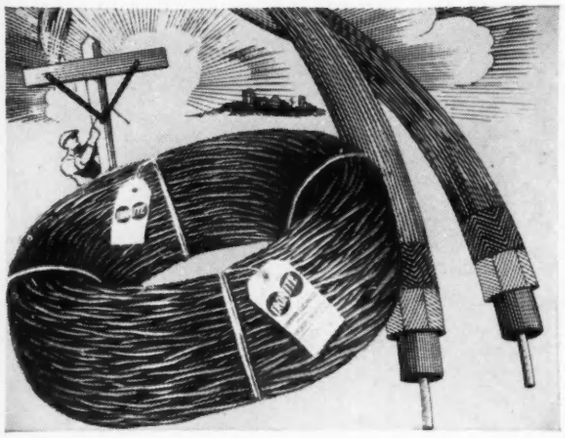
For Service from a Nearby Distribution Point

Order Your Line Supplies from

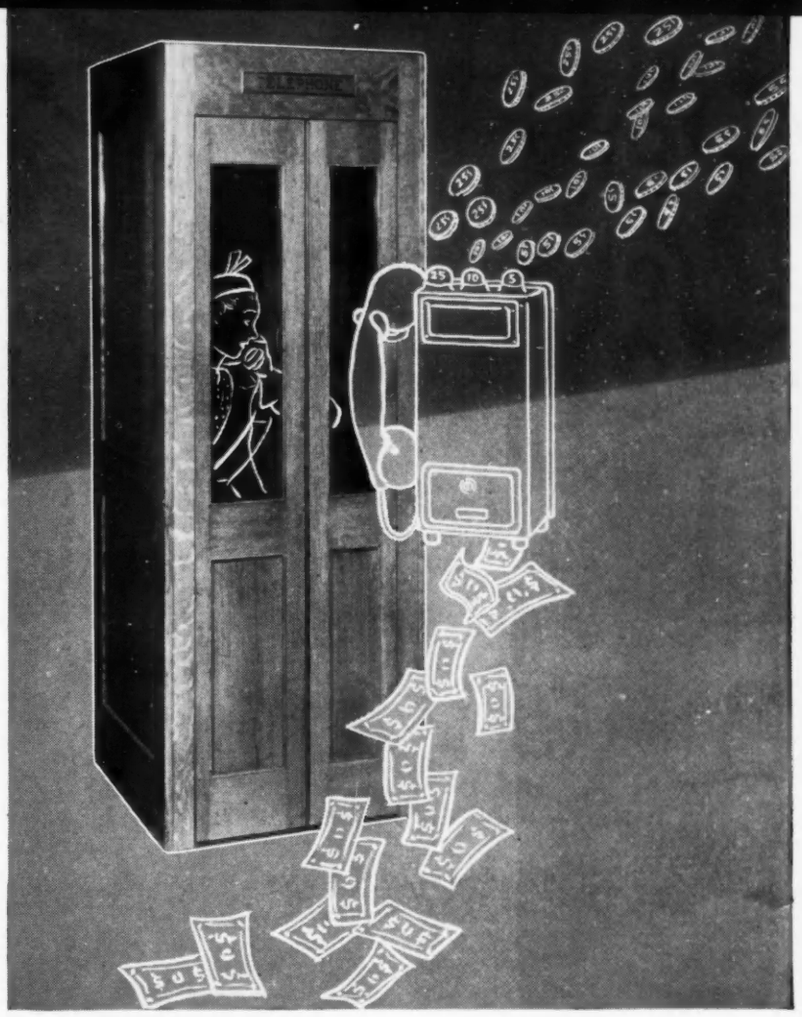
KELLOGG



Linemen Know the Difference. With RELIABLE ELECTRIC CO. B-27 Cable Terminal, all drop connections are made in front. Detachable mounting bracket permits easy installation. "Reliable" Sawtooth Discharge Blocks dispel static discharges without unnecessary grounding of the line.



Back From the Wars. Increased quantities of PARAGON ELECTRIC CO. Ironite Drop Wire are now available for domestic use. Ironite has the exceptional strength to stand unusual strains with complete safety. It is "armored" for extra weather protection, highly conductive and economical.



Throughout the Country it has been proved over and over that pay station revenues increase when the public is given the privacy of telephone booths. Churchill Booths particularly have the roominess, comfort, and privacy which attract business. A popular example is CHURCHILL CABINET CO. No. 100 Booth, acoustically designed, with automatic light and ventilator operated by door switch.

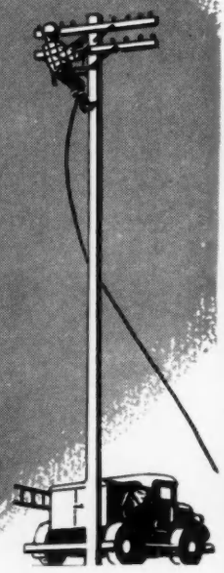
Long Life Expectancy is built into pressure-treated Southern Pine Poles and Crossarms. Carefully and thoroughly treated by the AMERICAN CREOSOTE WORKS, INC., these poles have the extra durability required for dependable service under the toughest climatic conditions.

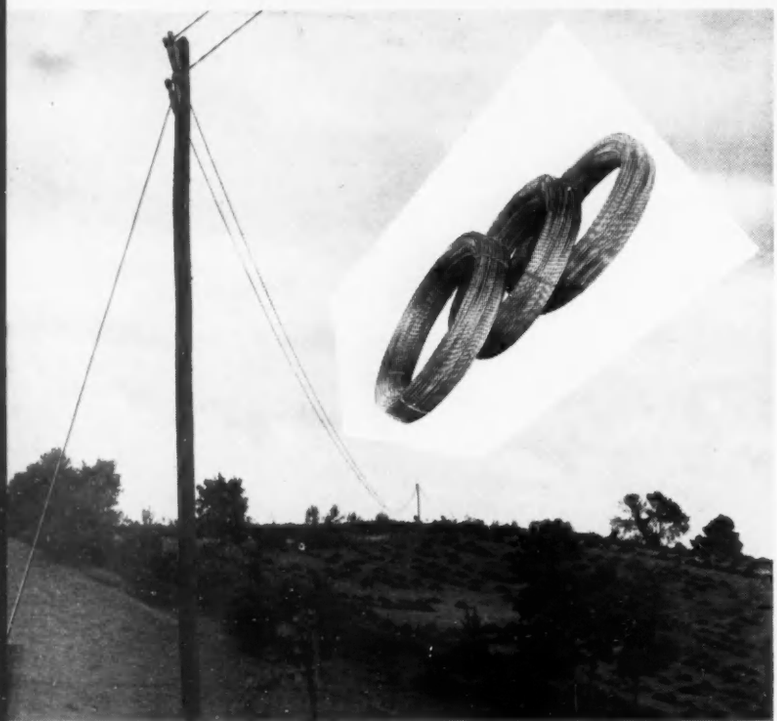
No More High Resistance Joints and intermittent open-and-closed circuits, when you use Kester Rosin-Core Solder! Made by KESTER SOLDER COMPANY. it seals joints permanently and protects them against service troubles. Used by Kellogg and many other leading manufacturers of communication equipment.

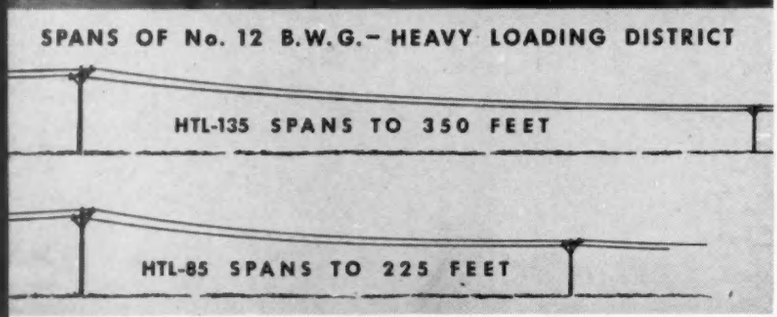
Smooth, Clean Cuts through toughest limbs are made quickly and easily with the Bartlett No. 44 Pole Saw. The tough, perfectly tempered steel blade is clearance ground to prevent binding while cutting green wood. Made by BARTLETT MANUFACTURING CO. in several pole lengths.

The Satisfaction Lasts
When You Buy Products

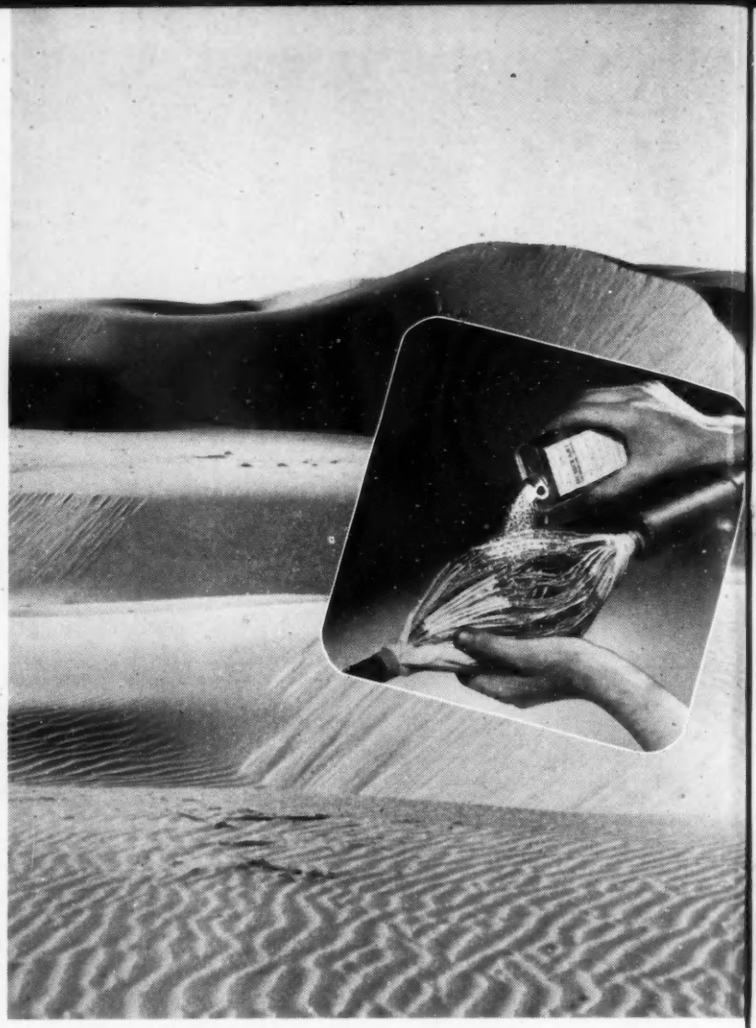
Recommended and Guaranteed by KELLOGG



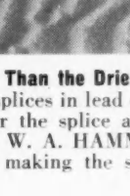




Save Two Ways on line wire replacement and construction by standardizing on INDIANA STEEL AND WIRE COMPANY'S Crapo HTL-135 and Crapo HTL-85 Line Wire. Because of their high tensile strength, these wires permit long spans, enable you to realize substantial savings in construction and maintenance costs. Galvanized by the famous Crapo Galvanizing Process.



Drier Than the Driest Desert! Drierite Desiccant is the safer way to dry out splices in lead covered cables. After splicing, just bind a cotton gauze under the splice and sprinkle Drierite granules among the conductors. This W. A. HAMMOND DRIERITE CO. product absorbs all moisture, thus making the splice about the driest part of the entire cable line.



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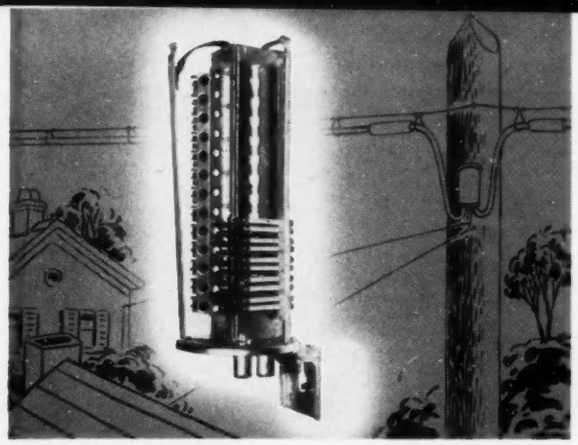
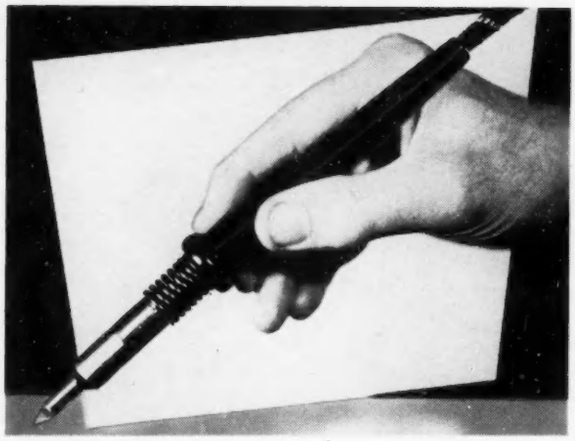
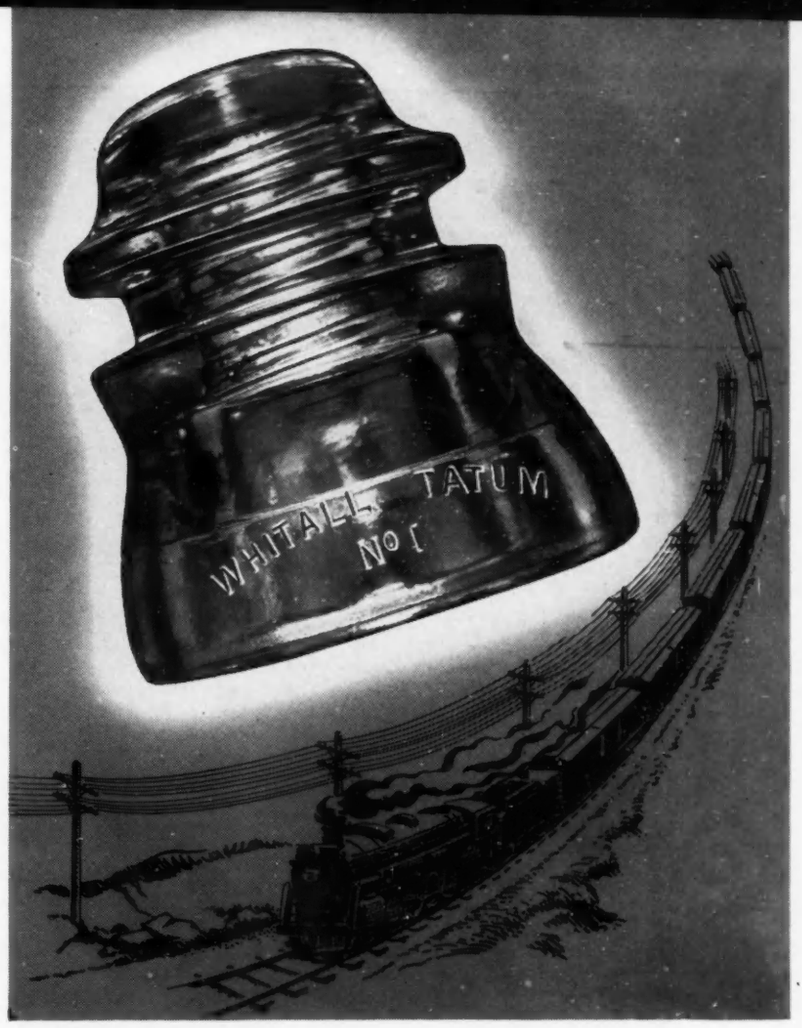


Nothing to It! Sectionalized cable runs simplify trouble shooting and transmission testing. The COOK ELECTRIC CO. UA-20 Cable Terminal permits easy testing in either direction. With capacity for 51 pairs, it provides highly effective lightning, power cross and station protection.



Neat, Precision Soldering is easy when you use a Vulcan Electric Soldering Iron. Made by VULCAN ELECTRIC CO. in 15 sizes of screw and plug tip types, these irons give unimpaired heat production. The "Pygmy" tool, shown above, is specially designed for delicate work.



Meet Every Service Need. No matter what your requirement, there is a size and style of Armstrong's Whitall Tatum Insulator to meet it. Products of ARMSTRONG CORK COMPANY, these quality insulators feature crystal clarity of glass, accurate gaging, and unusual resistance to wide variations in temperature. Armstrong's Whitall Tatum Insulators are best for reducing your maintenance expenses.

1 Spray Proof Vent Chambers. 2 High Acid Space. 3 Flote Plates. 4 Built-in Charge Indicators. 5 Hard Rubber Retainers. 6 Quarter-Sawed Douglas Fir Separators. 7 Super Braced Corner and Side Locks. 8. Supported Elements. 9 Steel Glass Jar (½ inch thick).
1
2
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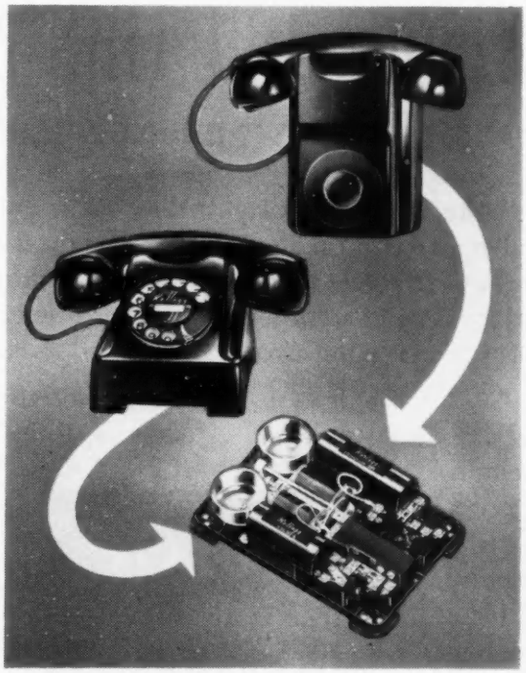
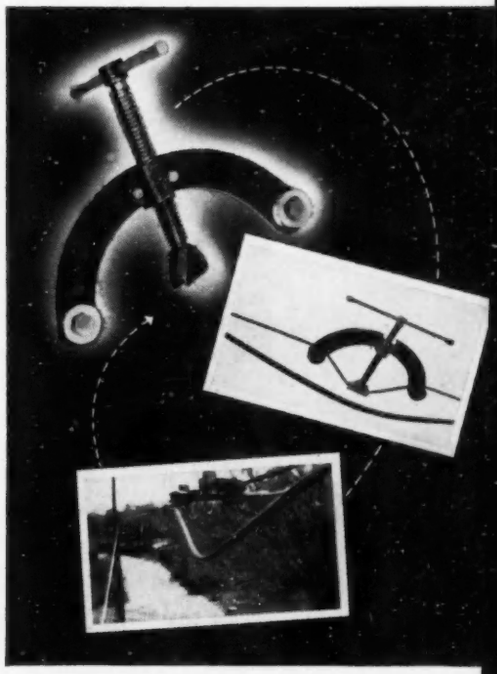
9

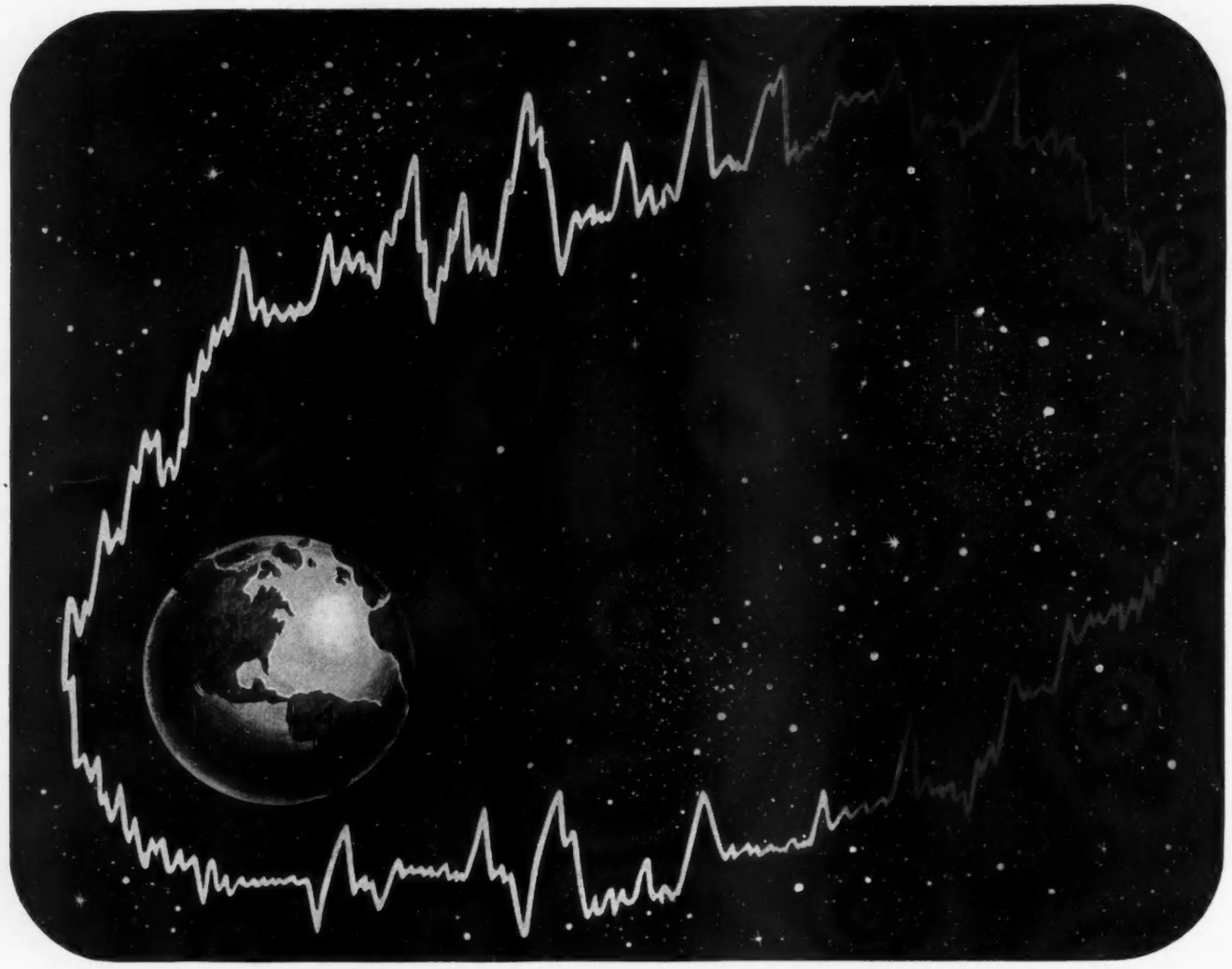
Modernize with Philco. For the latest in modern telephone battery design many engineers specify PHILCO Flotè. Developed specifically for today's full float service, the famous Flotè grid eliminates low cells, and measurably contributes to operating efficiency, long battery life and lower costs.



Simplicity is the keynote of the amazing new KELLOGG 1000 Series Masterphone. One base plate and two housings can be adapted to meet every subscriber need in desk or wall types. All components are simply plugged or screwed into position on the one base plate. A screw driver is the only tool needed.



Time and Labor Saver. The "Little Giant" Slack Puller is ideal for taking up and holding slack in spun messenger strand and cable before making cable repairs. A time-saver, it cuts insulation damage caused by working on tight cables. Made by CABLE SPINNING EQUIPMENT CO.



11 YEARS AGO THIS MONTH

THE HUMAN VOICE MADE ITS FIRST NON-STOP JOURNEY AROUND THE WORLD

On April 25, 1935, "long distance" was stretched to its full length. For on that date the first 'round-the-world telephone conversation took place . . . and another communications victory was won over time and space.

Yet, when measured by distance alone, this great achievement is far surpassed by the countless miles traveled by the human voice every second of the day in normal local service. And whether the distance is but a few blocks or thousands of miles the calls go through . . . promptly, clearly, without confusion . . . in keeping with the telephone tradition of faithfulness and dependability.

In Exide Batteries you will find the same dependability for which telephone service is famous throughout the world. Since 1895, forty years before the first trans-world conversation, Exides have been proving themselves worthy of that trust.

Exide
TELEPHONE BATTERIES

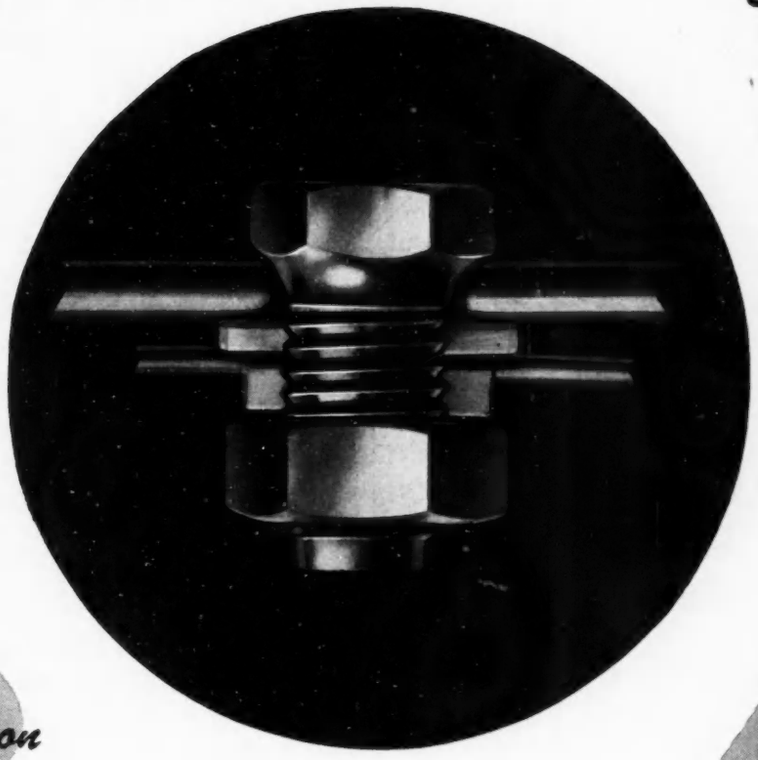
THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • Exide Batteries of Canada, Limited, Toronto

Reliable
because...

—as in all Reliable Telephone Equipment, the Reliable Solderless Connector is basically sound engineering. Precision manufacture, simplicity of design and carefully selected materials, plus constant laboratory testing means Reliable service under all conditions. Build for the future—specify Reliable equipment.

1 Excess Strength

Reliable Solderless Connectors are available for use with all types of conductors. They are made of high strength bronze and cannot be distorted with a standard socket wrench.



2 Uniform Connections

Precision threads—provide a high percentage of torque efficiency. This feature means thread friction is reduced to a minimum to attain increased pressure on the conductors.

3 Vibration Proof

Each type Reliable Solderless Bridging Connector is readily re-usable, yet will not loosen from vibration.

4 Non-Corrosive

Plating on connectors for iron wire taps will not wear off nor cause corrosion. Heavy washer separates line and tap wires.

RELIABLE
ELECTRIC COMPANY
3145 CARROLL AVENUE, CHICAGO 12, ILLINOIS

OVER 35 YEARS SERVICE TO THE TELEPHONE INDUSTRY

"It Seems to Us"

R. B. (Doc) Fairly, president of Southwestern Associated Tel. Co., Lubbock, Tex., was signally honored during the recent Texas convention. He was re-elected president of the Texas Chapter, Independent Pioneer Telephone Association and 2nd vice president of the Texas Telephone Association. Doc greeted our return to our home state with true Texas cordiality.

•

The perennial president of the Texas association, Oscar Burton, is looking forward to the selection of an executive secretary for that group. Applicants should communicate with the Texas Telephone Association, Austin, Texas. It is our information that the selection will not necessarily go to a native Texan.

•

Jay G. Mitchell, well known to our readers and to the Independent industry at large, hopes to return to his practice as Consulting Telephone Engineer as soon as he finishes his present assignment in the East. Jay served in the Signal Corps laboratories and has lived in Eatontown, N.J. during the war period. He will continue his writing in our publications.

•

Fred Henck has returned from the war and joined Roland C. Davies in our Washington Bureau. The telephone industry will hear more and more of Fred and we want to introduce him to you as a newshawk who knows his business. He is actively assisting Roland Davies in publishing *Telecommunications Reports.*

•

Leslie A. Gritten, sec.-treas. of the Oregon Independent Telephone Assoc., notifies us that a joint Oregon-Washington meeting at Hood River did not materialize and official dates for the Oregon convention are June 21 and 22 at the Multnomah Hotel, Portland.

TELEPHONE ENGINEER & MANAGEMENT

Vol. 50, No. 4 **APRIL, 1946**

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SERVING THE SIX BILLION DOLLAR TELEPHONE INDUSTRY

Founded in 1909

Office of Publication, Pontiac, Illinois. Executive and Editorial Offices 7720 Sheridan Road, Chicago 26 Illinois. Phone Rogers Park 3040. RAY W. SMITH, Editor; ROY F. SMITH, Adv. Manager, DON C. SORENSEN, Sales Prom. Mgr. Subscriptions: U. S., Cuba, Mexico $1.50 Per Year; Canada, $2.00; In all Other Countries, $3.50. Single copies, U.S.A., 15 cents. Single copy JANUARY 15 BLUE BOOK BUYER's GUIDE $1.00. All subscriptions should be sent DIRECT to 7720 Sheridan Rd. Chicago 26, Illinois.

Who Sells Telephone Directory Advertising for Both Independent and Bell Telephone Companies in Over 3300 Cities and Towns in the U. S. And Canada? Ans.--
L.M.BERRY & CO.
Telephone Bldg. Dayton, O.
Telephones: L. D. Loop 16; ADams 4127

Lectures
Secretaries
Executives
Sales Reports
Correspondence Courses
Stenographic
Gray Audograph
PRESCRIPTION
Prescription orders
MAIL & PHONE ORDER DEPT.
Department stores
For the blind
Doctors
Newspapers
Flight reports
Plane dispatcher

How will YOU use the GRAY AUDOGRAPH?

Conferences

Legal testimony

Studio recording

Home recording

During the war years when we were busy turning out radar and other intricate electronic devices (including sound recorders) for the armed forces, Gray engineers devoted every spare moment on one of their most important projects — research and experimental work on the Gray Audograph.

Now it's in production . . . the most versatile recording — transcribing machine we believe you've ever seen! It no more resembles the cumbersome "old timers" than a jet-propelled P-80 resembles the "flying crates" of World War I. It isn't a copy of anything nor a 1946 adaption of an old model — it's really NEW inside and out! For instance: The Gray Audograph is small enough (9½" x 9½" x 6½") and light enough (about 13 pounds) to tuck under your arm when you leave the office, take home and record your favorite radio program!

And don't think you have to handle it with kid gloves. Here's a machine so ruggedly engineered that you can shake it or tip it on its side and it will keep right on recording or transcribing! Gray (originators of the Telephone Pay Station) specialize in designing simple, service-free mechanisms.

The Gray Audograph uses featherweight, unbreakable Flexograph records. They're easy to transcribe, easiest to file and constitute a permanent record always ready to "play back". Flexographs are available in three sizes — the largest recording for a full sixty minutes! We've shown eighteen uses for the Gray Audograph and can think of many more. How will *you* use it in *your* business?

SEND FOR BOOKLET

THE GRAY MANUFACTURING COMPANY

W. E. DITMARS PRESIDENT • 16 ARBOR STREET HARTFORD 6, CONN. • 230 PARK AVE. NEW YORK 17, N. Y.

American

Line Construction Bodies

Type 4460 for General Service and Meter Installation... features generous side compartments and open bed construction. Type 4460 bodies are built in 3 basic lengths and can be mounted on almost any truck chassis with capacity ratings from ½ ton to 1½ ton.

★ ★ ★

CREW EFFICIENCY

Proper selection of equipment from American's complete line.
Equipment readily accessible.
Supplies conveniently arranged within easy reach.
Good ventilation.
All-weather protection.

LOW COST PER MILE

Efficient design and application of welded formed steel sections result in greater pay loads.
Great carrying capacity.
Full utilization of space.
Bodies outwear chassis as much as 3 to 1.

EXCLUSIVE DESIGN

Offset side panels put ladders and pike poles within limits of body.
Good load distribution.
Derrick trough (less lifting).
Platform extension.
Material protecting roof design.
Rattle-proof, tension-tight door with cam lock.

★

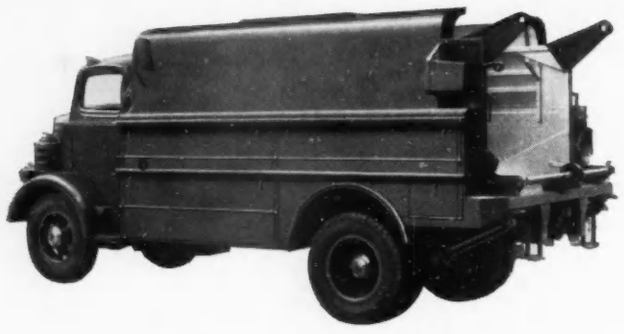
LOW COST PER MILE OF OPERATION

Full utility value plus efficient design, rather than trick gadgets and impractical ideas, has been American's 30-year policy. A scientific ratio of **WEIGHT, STRENGTH** and **DURABILITY**—due to special designs of formed steel sections... **CONVENIENCE**—due to unit control bins for tool storage... **SAFETY**—the result of American's experience in body design... all point to low labor and maintenance cost.

JUST OFF THE PRESS!

Write for the new engineering-styled bulletin on American's Line Construction Bodies. Included are dimensions, sizes, equipment inventory. Mailed promptly upon request.

Line Construction Bodies



American Line Construction Body is the accepted design for utility companies. Exclusive features pictured above are listed at the left. American makes six basic length models for every utility requirement.

ACB and

THE *American* COACH and BODY COMPANY
9503 WOODLAND AVE., CLEVELAND 4, OHIO
"Baker American" . Baker Equipment Engineering Co., Richmond, Va. . Sales and Assembly

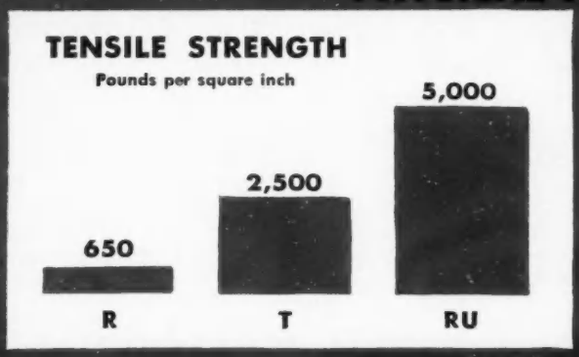
COMPARE Laytex (RU)

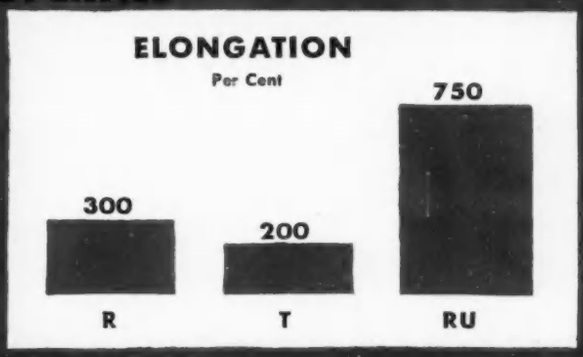
Reg. U. S. Trade Mark

Electrically and Physically

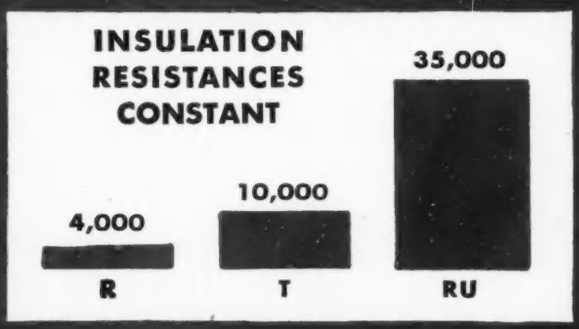
(60° Operation)

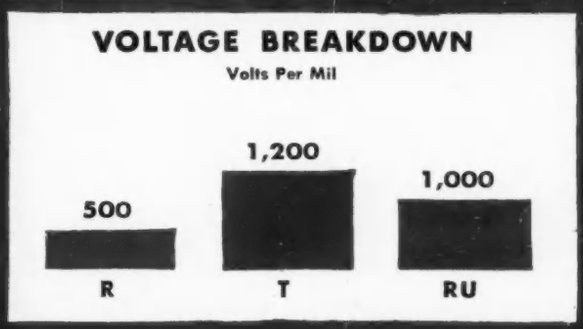
PHYSICAL PROPERTIES





ELECTRICAL PROPERTIES





THREE TYPES of building wire are authorized under the new Electrical Code. These are:

R—Used by the Industry since its inception. The copper conductor has a Code rubber insulation and fibrous overall cover.

T—A copper conductor with VINYLITE (a synthetic compound) insulation.

RU—LAYTEX. This type has a copper conductor, *natural rubber insulation* and fibrous cover.

The charts above show the wide margin by which LAYTEX leads in physical and electrical qualities. This is America's lightest weight, smallest diameter, natural rubber covered wire.

The following Laytex Wires and Cables are now available to the Telephone Industry without restriction:

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Our Technicians will gladly assist with detailed information on

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And after the hole is dug, the derrick on this same machine will set the poles. Easily handles anything 40 to 45 feet long, weighing 2000 to 2500 pounds. You can readily see the advantage of this combination—there's no need for an extra line truck and extra crew to follow along behind the earth boring machine, setting poles. One piece of equipment and one crew does it all!

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Manufacturers of: Utility Bodies • Winches • Earth Boring Machines • Pole and Cable Reel Trailers and other Public Utility Equipment.

General Offices: **EDGERTON, WISCONSIN, U.S.A.**

Greater protection for drop wire with

DURABLE, WEATHER RESISTANT NEOPRENE

A SHEATH OF NEOPRENE RESISTS...

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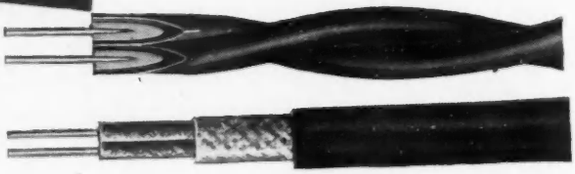
- HEAT AND FLAME
- ACID FUMES AND SMOKE
- COMPRESSION CUTS



NEOPRENE has made possible the development of a new-type telephone drop wire with improved service life. The tough, durable neoprene sheath gives the insulation real protection!

When you select drop wire—or any type of wire and cable—make sure it is jacketed with neoprene. This is your assurance that the sheath will give longer service—resisting oxygen and ozone, sunlight and weathering, abrasion, heat, flame and many chemicals.

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Get Set to Go Now With a NEALE SPINNER

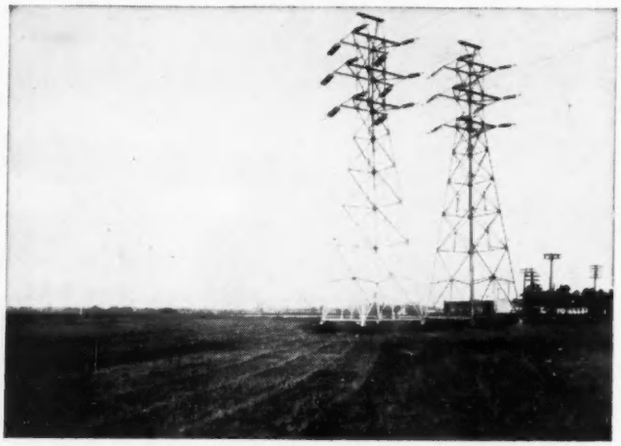
Your outside cable plant is one of your most expensive investments. A Maintenance Spinning Program will increase the life of your aerial cable investment 20% to 35% and you will have 60% less maintenance expense.

Write your jobber for help in starting your program.

CABLE SPINNING EQUIPMENT CO.

TOPEKA, KANSAS

Now's the time to Spray your weeds away!



2-4D Dow Weed Killer

Kills weeds easily...completely...chemically

2-4 Dow offers these advantages

- √ **Harmless to ordinary grasses**
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SAVE MONEY ON MAINTENANCE—Right now, maintenance departments and individuals responsible for weed control everywhere are showing real interest in 2-4 Dow Weed Killer, the new low cost *spray* treatment for obnoxious plant growth.

2-4 Dow Weed Killer eliminates the troublesome job of hand digging, cutting and hoeing. Spray the weed *tops*—kill *roots* and all! Does not harm common grasses when used as directed.

Use 2-4 Dow Weed Killer wherever weeds must go so grass can grow—along roads and streets, in vacant lots, along telephone and power and railroad lines—on lawns, parks, playgrounds, golf courses, cemeteries and airfields. Available in powder or liquid form—packed in convenient sizes for every need.

See Your Dealer or Write Direct!

And ask about other selective weed killers for specific purposes, soon to be announced.

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WITHOUT MOVING PARTS

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Flotrol has been thoroughly tested for a period of over two years and has proven unsurpassed for Telephone . . . Railroad . . . Pipe Line . . . Standby and Control Battery Service and all other applications requiring a dependable source of constant voltage direct current.

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SELENIUM RECTIFIER

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DESIGNERS AND MANUFACTURERS OF SUB-CYCLE

SURPLUS GOVERNMENT-OWNED

CARRIER EQUIPMENT

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Consisting of Telephone and Telegraph Repeaters, Terminals, Ringing Equipment and Test Sets Originally costing about

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Listings completely describing the material are now available at any War Assets Administration Regional Office. Ask for "WA Listing No. L-43, April 3, 1946," which contains detailed information about condition, location of items and how to obtain permission to inspect material at U. S. Signal Corps depots on and after April 18, 1946. This listing also contains an offer-to-purchase-form which *must be used* for the submission of all bids.

The equipment and parts are unpackaged (although some cable is on reels) but will be packaged after sale, when necessary, to insure safe shipment. All sales will be for cash unless credit terms have been arranged.

All bids must be delivered not later than 10 A. M., April 26, 1946, to the War Assets Administration, 70 Pine Street, New York 5, N. Y., at which time bids will be publicly opened and read. The right is reserved to reject any or all bids.

VETERANS OF WORLD WAR II: To help you in purchasing surplus property from War Assets Administration, a veterans' unit has been established in each of our Regional Offices.

For Further Information, Wire, Write, Telephone, or Call at Address Above or at Any of the Regional Offices Below.

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OFFICES LISTED BELOW ARE TEMPORARILY IN RECONSTRUCTION FINANCE CORPORATION AGENCIES

Offices located at: Atlanta · Birmingham · Boston · Charlotte · Chicago · Cleveland · Dallas · Denver Detroit · Helena · Houston · Jacksonville · Kansas City, Mo. · Little Rock · Los Angeles · Louisville Minneapolis · Nashville · New Orleans · New York · Oklahoma City · Omaha · Philadelphia Portland, Ore. · Richmond · St. Louis · Salt Lake City · San Antonio · San Francisco · Seattle · Spokane Cincinnati · Fort Worth (Telephone 3-5381)

464

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Today's International Trucks are the best ever built. They represent more than 40 years of truck engineering and manufacturing experience. This engineering and manufacturing has long been so outstanding that in the last 15 years more heavy-duty Internationals have been purchased for civilian use than any other make.

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152-162 mc. + 72-76 mc. + 30-44 mc. Fixed Station—Mobile—Repeater and Relaying Equipment Of Advanced And Field Proven Postwar Design.

Selective (Dial) Calling Immediately Available With All Equipment. Write Us Your Requirements—Our Engineering Department Is At Your Service.

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TOP PERFORMANCE

MODEL 4013-AL
Heavy service Unit with overhead ladder.

because . . .

YORK-HOOVER BODIES

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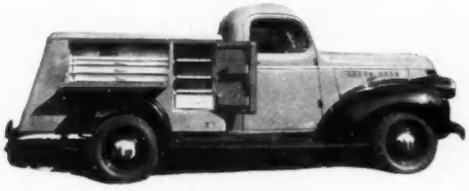
Compact, Practical and Efficient!



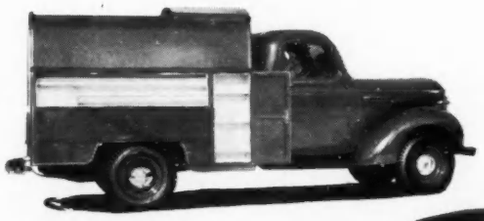
MODEL LIU-78
Light Service Body fully enclosed.

COMPACT . . . because all available loading space is profitably utilized.

PRACTICAL . . . because each body principle has been actually proven in the field.

EFFICIENT . . . because there is a place for all necessary tools and materials.

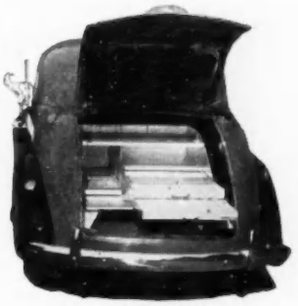
Write for complete information NOW!



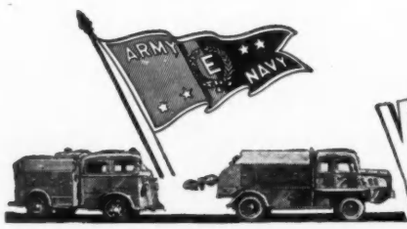
MODEL 4013-AT
Service body with telescoping roof.

MODEL 4013
Light service body open type.

MODEL 4013-AS
Light service body with stationary roof.



MODEL 39
Service Unit with ladder brackets.



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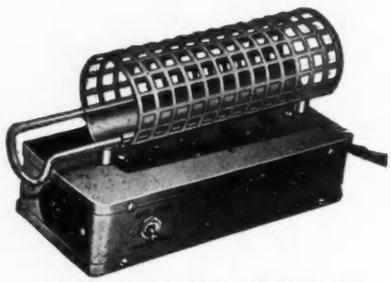
Through 25 years of soldering iron manufacturing, Drake has developed soldering products that set new high standards of quality and long-lived performance.

DRAKE No. 400, for example, is ideal for work in small places—weighs only 8 ounces and is only 9 inches long, yet it is a 60-watt iron.

DRAKE No. 600-10, is conservatively rated at 100 watts, but is only 10 inches long.

DRAKE SOLDER POTS are available in 150 and 300 watt ratings to meet varying needs.



DRAKE HEAT CONTROL is a fool-proof device for keeping idling irons ready for quick use.

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The name DRAKE means utmost value—your assurance of long, economical usage.

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Copperweld wire does not depend for protection upon a thin deposit that temporarily coats the steel core, but upon a thick covering of copper, the molecules of which are permanently welded to those of the alloy steel by the exclusive Copperweld molten-welding process. The cut-away section above illustrates this point.

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Yes—the protection afforded by Copperweld is "more than skin deep"—it really lasts! So, wherever you need the conductivity and rust-resistance of copper with the rugged strength of steel, play safe—install Copperweld. Remember that Copperweld products have been successfully serving industry for more than thirty years.

Engineering data sent on request.

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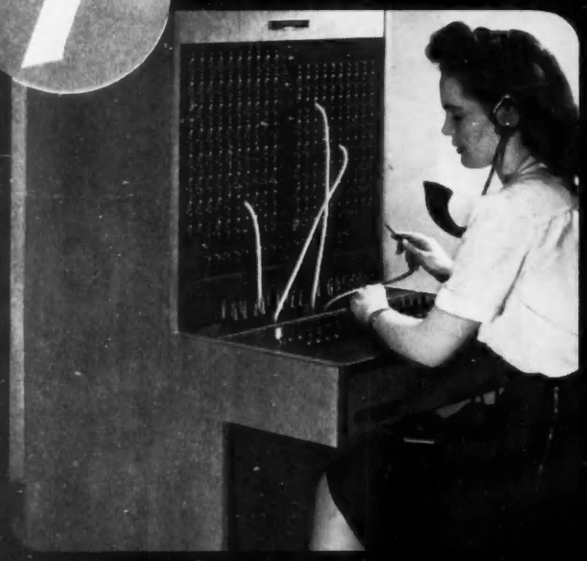
In four basic fields

STROMBERG-CARLSON BUILDS *engineered toy*

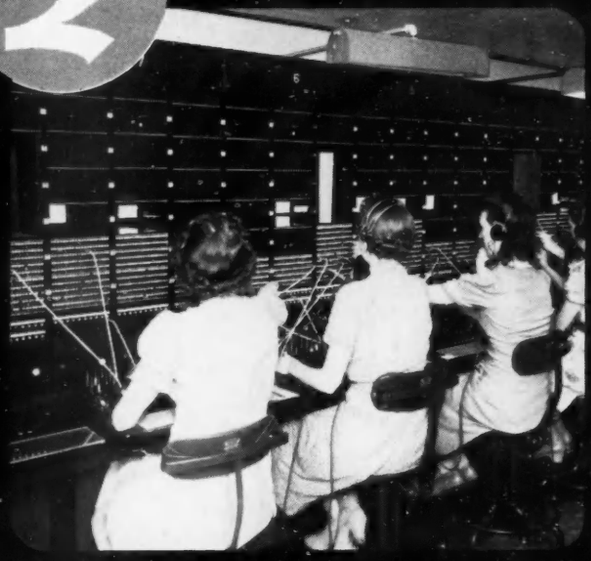
1



MAGNETO

For equipping the magneto exchange, Stromberg-Carlson makes Switchboards in both drop signal and lamp signal types. A complete line of Handset Telephones, in a choice of either Desk Set or Wall Models, is also available.

2



CENTRAL ENERGY

For the central energy exchange, Stromberg-Carlson makes every type of manual switchboard, including Multiple, Super-Service, Junior Multiple, Non-Multiple, Toll Boards, and P.B.X., including a complete line of subscriber instruments.

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Regardless of the type of telephone exchange you are operating, you will find that Stromberg-Carlson can furnish Switchboards, Subscriber Instruments, and Accessories engineered to fit *your* specific requirements.

With this complete line of telephone equipment, Stromberg-Carlson representatives can offer you the precise type of apparatus which will do the exact job that you require.

Before buying any equipment, always consult Stromberg-Carlson to receive the benefit of this complete line.

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to your needs

3

RELAYDIAL

For the dial exchange, Stromberg-Carlson manufactures RELAYDIAL Switchboards, noted for their reliability of operation and maintenance. Stromberg-Carlson also is producer of a complete line of subscriber instruments for dial use.

4

"XY" SYSTEM

For switching equipment in large dial exchanges, Stromberg-Carlson is the maker of the sensational "XY" Switch. Compact, and more efficient, it's the talk of the industry. • Stromberg-Carlson's new telephone dials are also models of efficiency.

DIAL EQUIPMENT

Memo:

To Those Visiting Chicago During the Spring U.S.I.T.A. Meeting STROMBERG-CARLSON Headquarters will be in Suite 345-6-7, Edgewater Beach Hotel

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T AN INDUSTRIAL SYSTEMS • RADIOS, RADIO-PHONOGRAPHS AND TELEVISION

EDITORIAL

"Now is the time for all good men -----"

THIS issue of the magazine should reach its readers just about the time the Executives Conference of the United States Independent Telephone Association is in session at the Edgewater Beach Hotel in Chicago. That Conference is dedicated to the consideration of postwar problems of the Independent telephone industry—which problems at present are many and varied.

We are ourselves dealing, in the pages of this issue, with some of the questions of immediate interest to telephone people—namely, construction and maintenance. Those questions are of both immediate and important interest because construction in volume was impossible during the war years, maintenance had to be of makeshift quality at many places during that time, and because applicants in large numbers are now clamoring for telephone service that cannot be satisfactorily supplied until the construction has been done and deferred maintenance overcome.

The existing postwar problems of the Independent telephone industry are of greater variety, and perhaps of greater importance, than its usual crop of problems. Many of the questions now confronting Independent telephone men are of a type that is new to the telephone business.

Integration into wire telephony of a variety of uses of radio presents a whole series of new problems to the telephone man. How, for instance, can he best use carrier current, and where? To what extent is radio or applications of radio usable in a practical manner for rural service? Should his company undertake to supply mobile radio service? On what basis should the telephone company charge for these new things? And so on.

Wartime developments of different kinds are bringing about, or will bring about, other problems just as perplexing. An example of this is the question about the use of sound recording devices in connection with telephone service.

Besides these new problems that are generally the result of the speeding up of technological development because of the war, the industry has some unusual perplexities that are nearer home, telephonically speaking. One of these is the current "held order" situation—the like of which the industry has never seen before. Another is that natural aftermath of the war, the shortage, for the time being, of new equipment and materials.

One undeniably important question that must be dealt with is the new and higher level of costs to which the industry has become subject because of wage rises and higher costs of equipment, materials, and many other things consumed in the process of supplying telephone service. This introduces at many places questions as to the adequacy of present rates for the service or, if the income from the service cannot be made sufficient, then questions as to the ability of the industry to adequately finance itself in the face of decreasing net earnings.

There are plenty of things to talk about at the Executives Conference, even in addition to the fine program the Association has provided. That discussion of all these questions will help clarify them, goes without saying.

We think there is another important element in this present situation of the Independent telephone industry. To manage a telephone business or any business successfully and profitably in these swift-moving days of new-fangled things and new kinds of competition, you've got to be pretty good.

Independent telephone people are pretty good. To keep the industry up with the procession during the coming years they'll have to continue to be that—or better.

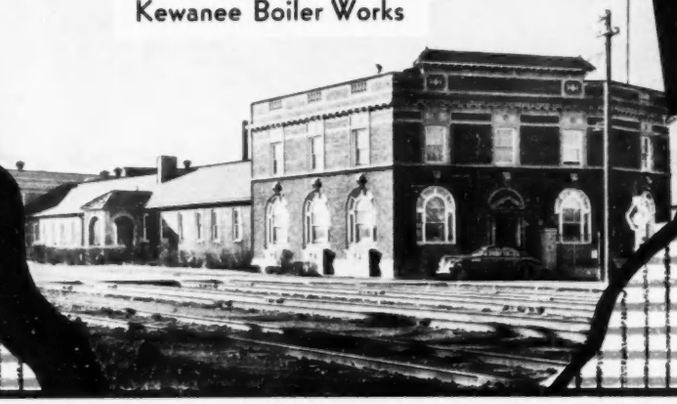
The industry will need all the experience, skill, knowledge and ingenuity of its people, during the coming years, more than it ever needed those things before. "Now is the time for all good men to come to the aid of the party."

The Walworth Company, Kewanee Works

KEWANEE *Illinois*

Another of the More Than 1000 American Cities and Towns for which Telephone Directories are Published by General Telephone Directory Company.

Kewanee Boiler Works



The town of Kewanee takes its name from Sac Indian language. Translated "Kewanee" means "prairie chicken". The name was chosen because the prairie chickens were here in great numbers and formed a large part of the Indians' food.

Kewanee is the home of 14 major industries and many smaller concerns with an annual payroll of nearly 9 million dollars. Two of the major industrial concerns are the Walworth Company and the Kewanee Boiler Works. Kewanee boilers are known all over the world. Among other goods manufactured in Kewanee are: truck bodies, burial vaults, chicken brooders, gloves, barrels, and agricultural equipment

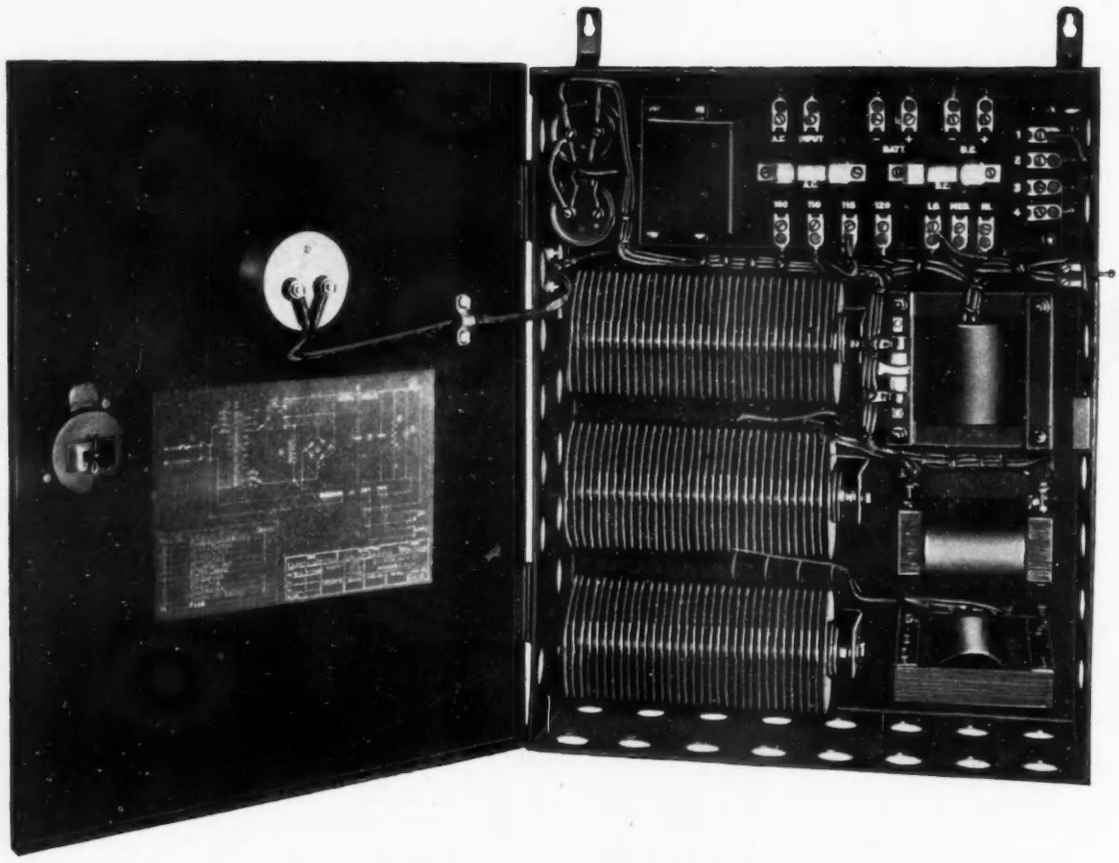
In 1937 the Illinois Commercial Telephone Company, which serves this community of 20,000 people, employed our organization to handle all of the details of directory publication for them. In nine years the Telephone Company has seen its gross advertising revenue from Directory Operations increased by more than 700%.

If the publication of your Telephone Directory is proving a chore — or if you contemplate revisions in your present directory procedure, we invite you to write for a free copy of, "Making More Money From Your Telephone Directory" This interesting booklet describes in detail the complete publication services rendered by our organization. Our services relieve the Telephone Company of all of the time consuming details of publication, including the sale of advertising, proof reading and preparation for mailing or distribution.

Walter Schuckard returned to civilian life and to our Company after nearly three years in the Army. Schuckard was inducted as a private at Ft. Benjamin Harrison and received his last promotion to Sergeant while stationed at Air Force Headquarters in Caserta, Italy

GENERAL TELEPHONE DIRECTORY COMPANY

Eastern Office: Ben Hur Bldg., Crawfordsville, Indiana. Telephone 2270
Western Office: Press-Telegram Bldg., Long Beach 2, Calif. Telephone 672-22



Extras at no Extra Cost!

***When you buy an* ELECTROX RECTIFIER** — Battery Charger or Battery Eliminator — you get MORE in the way of efficiency, performance, dependability, and long life. You get PLUS VALUE; for Value is measured not in terms of what you pay, but what you get for what you pay!

ELECTROX RECTIFIERS are made **FOR** telephone men **BY** telephone men who know the special needs of the telephone industry . . . by men who know the importance of building into each rectifier the EXTRA performance, absolute dependability, and EXTRA stamina needed ***when emergency calls!***

* * * * * * * * *

ELECTROX BATTERY CHARGERS — all types, all capacities, for all telephone service. Automatic chargers; trickle chargers. Trouble-free. Require no routine adjustments. Capacities of 1 to 12 amperes, from 24 to 48 volts. Other capacities available to meet individual requirements.

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ELECTROX DIVISION

SCHAUER MACHINE CO.

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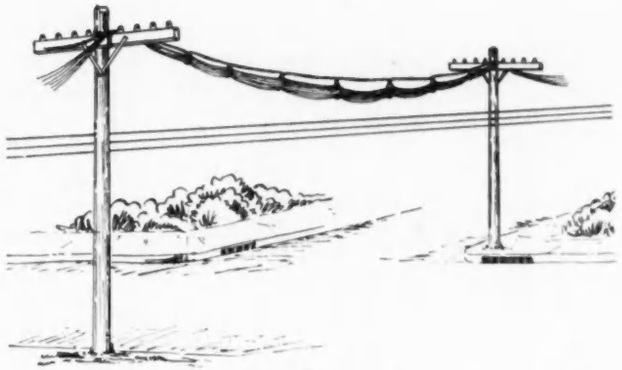


Fig. 2—Use of wire sling when stringing wire over power line.

BETTER CONSTRUCTION

for Better Service

THAT good construction pays off has been shown by the record of those companies that have built well and adequately maintained their lines. Companies that have used haphazard methods and allowed their plant to gradually fall apart are usually in the red and their service in disrepute.

Dead-ends for Bracket Lines

A large percentage of all rural construction is of the bracket type. One of the weak spots in a bracket line is at dead-end points. It is essential that wood brackets be reinforced at dead-end points. This can be done either with a wire reinforcement or by metal reinforcing straps. Both methods are shown in Fig. 1. The steel clips are also useful on slight curves in the line where there is a tendency for the wire to pull the bracket away from the pole.

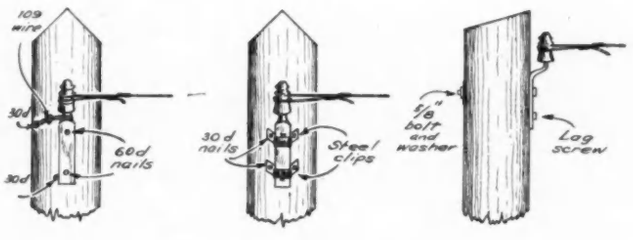
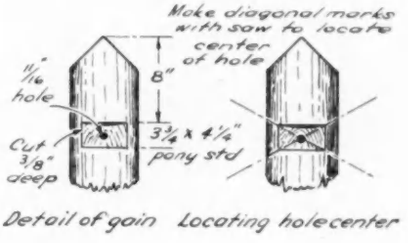


Fig. 1 — Method of dead-ending bracket lines.

For long span construction, special heavy duty type brackets attached to the pole with a through bolt and a lag screw should be used as shown. Long spans are often dead-ended by means of a clevis and strain insulator type of support. The leakage resistance of this type of insulator is not, in the opinion of the writer, sufficiently high (wet weather) to warrant its use on rural construction. This is particularly true where long span construction is paralleled by rural power lines as due to the high voltages

Good construction means *good workmanship* and *standard practices*. The test of time has shown that standard methods will give best service over the longest period for the least money. The following paragraphs touch on various common construction methods which are sometimes done wrong. The methods shown are largely standard with the larger companies.


Make diagonal marks with saw to locate center of hole
11/16" hole
8"
Cut 3/8" deep
3 3/4 x 4 1/4" pony std
Detail of gain
Locating hole center

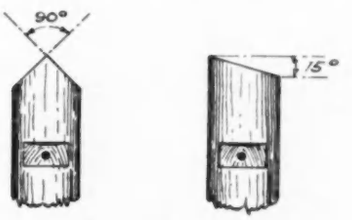


Fig. 3—Standard pole framing methods.

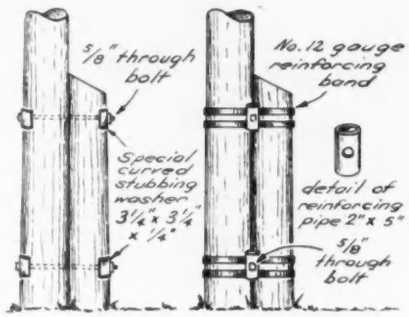

5/8" through bolt
No. 12 gauge reinforcing band
Special curved stubbing washer 3 1/4" x 3 1/4" x 1/4"
detail of reinforcing pipe 2" x 5"
5/8" through bolt

Fig. 4—Two methods of stubbing poles.

induced in the telephone lines even slight leakage during wet weather will often cause serious noise.

Wire Stringing Hazards

Wire stringing is one of the most hazardous of the various phases of outside plant construction. The hazard results from the possibility of the wires sagging across road ways and becoming entangled in passing vehicles. Equally dangerous the wires may contact near-by power circuits thereby resulting in a high voltage shock to the linemen engaged in the pulling operation.

A number of serious accidents have occurred where telephone wires are pulled over power wires and allowed to sag down and touch the power wires. Whenever a situation arises where telephone wires are strung over power wires, special wire slings should be placed on the crossing poles and the wires should be handled as shown in Fig. 2. A little extra caution during wire stringing operations may save a life.

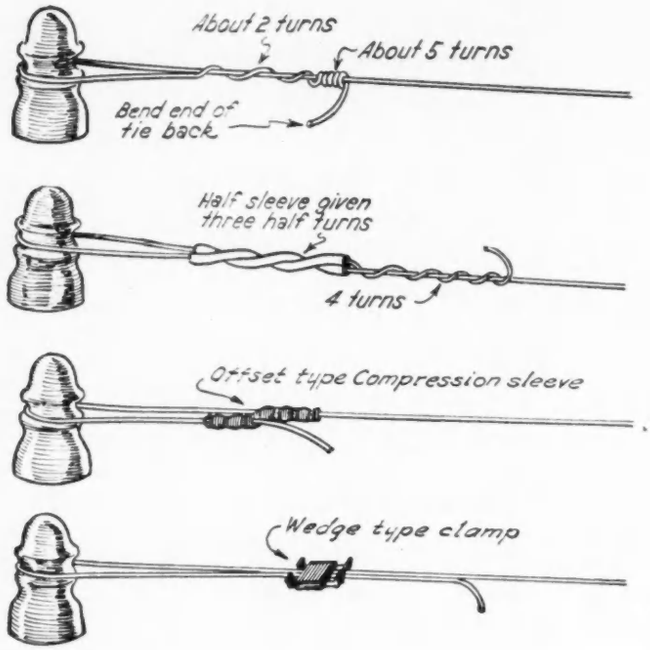


Fig. 6—Wire dead-ending methods.

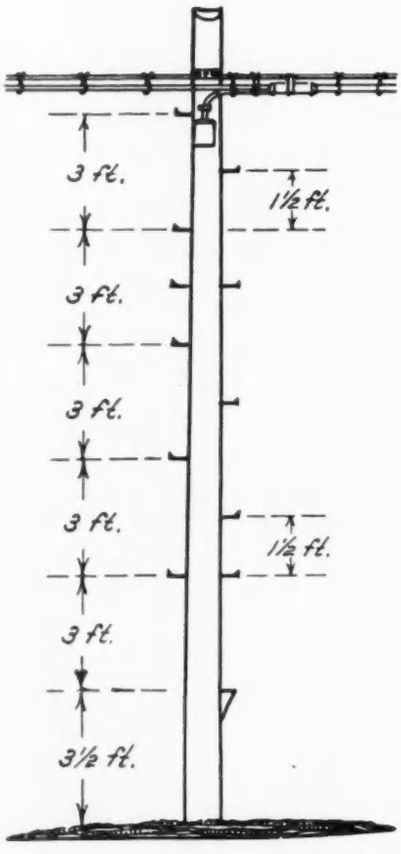


Fig. 5—Terminal pole stepping method.

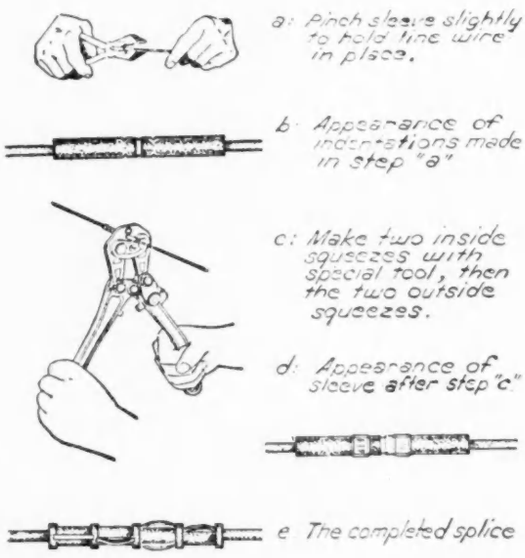

a: Pinch sleeve slightly to hold line wire in place.
b: Appearance of indentations made in step "a"
c: Make two inside squeezes with special tool, then the two outside squeezes.
d: Appearance of sleeve after step "c"
e: The completed splice

Fig. 7—Application of compression type sleeves to line wire.

Standard Framing Methods

Present day poles are usually purchased already roofed and gained. But in connection with the re-use of old poles as well as new poles which are not framed by the pole company, it is necessary to do this on the job. Fig. 3 illustrates the standard framing practice. Poles may be provided with a double slope roof or a single slope roof. Modern practice favors the single slope roof.

Pole Stubbing

Normally pole stubbing is not considered an economical practice. The cost of placing a stub may exceed the cost

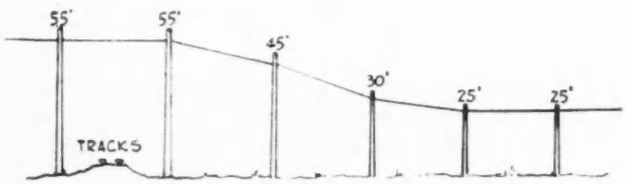


Fig. 8—Pole grading at a railroad crossing point.

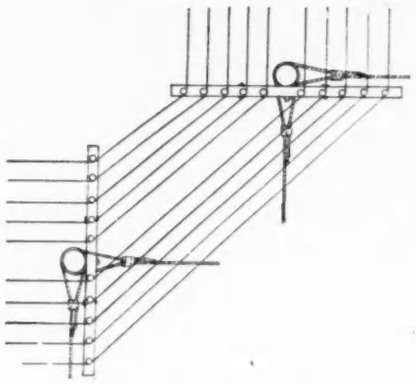


Fig. 9—A two pole corner.

of the complete pole replacement. This is particularly true on poles where only a few fixtures would need to be transferred to the new pole. The use of *pole stubs* is sometimes advisable with poles which are heavily loaded such as terminal poles, corner poles, etc.

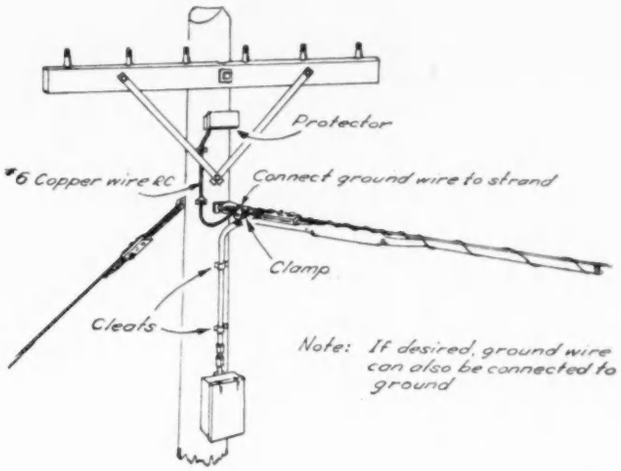


Fig 12—Correct connection of ground strip of a group protector at junction of open wire and cable.

Pole Stepping

Pole steps should be placed on important cable terminal poles. Fig. 5 illustrates one method of pole stepping. Pole steps should be so arranged that they do not make it easy for children to climb the pole. Extra steps should be provided near the top of the pole for the lineman to stand on when working on the terminal.

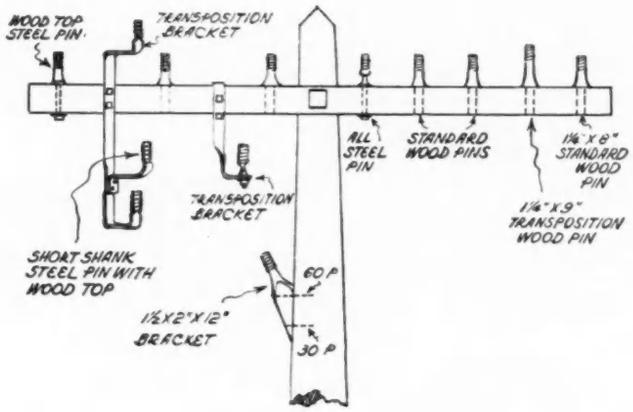


Fig. 10 — Standard crossarm pins and fixtures.

Present day pole shortages have temporarily at least, made pole stubbing advisable in some cases. Two methods that have been successfully used for pole stubbing are shown in Fig. 4. For small lightly loaded poles, the use of long through bolts and special curved stubbing washers should prove adequate.

For heavy poles, the use of galvanized reinforcing bands and compression pipes is preferable.

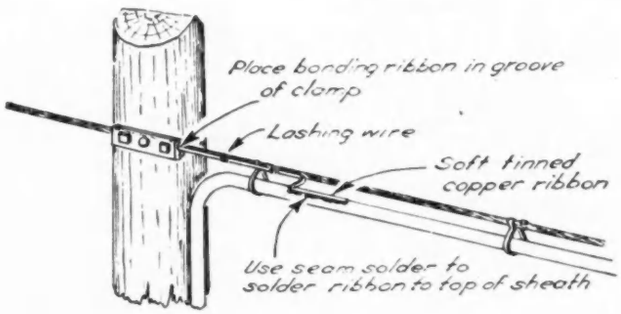

Place bonding ribbon in groove of clamp
Lashing wire
Soft tinned copper ribbon
Use seam solder to solder ribbon to top of sheath

Fig. 11 — Cable bonding method.

Wire at Dead Ends

There are several ways in which line wires may be dead ended. These are illustrated in Fig. 6. The use of the offset type of compression sleeve or the wedge type clamp is recommended. Hand make-ups are apt to slip and give trouble and should not be used. The wedge type clamp facilitates slack adjustment.

Modern Splicing Method

The quality of the telephone service rendered over rural open wire or toll circuits is largely dependent on the care with which splices are made. No single construction item is quite as important as the making of mechanically secure and electrically low resistance line wire splices. Service on thousands of rural stations of the "switcher type" is today poor largely because splices are almost entirely of the hand type. Even well made Western Union hand splices are likely to give trouble. It is inexcusable for any telephone company (switcher or otherwise) not to be equipped to make standard compression (or rolled) type splices. The tool cost is low and the sleeve cost negligible. If the sleeves are properly applied they are trouble free for the life of the wire. Fig. 7 illustrates the simplicity of making a compression type splice.

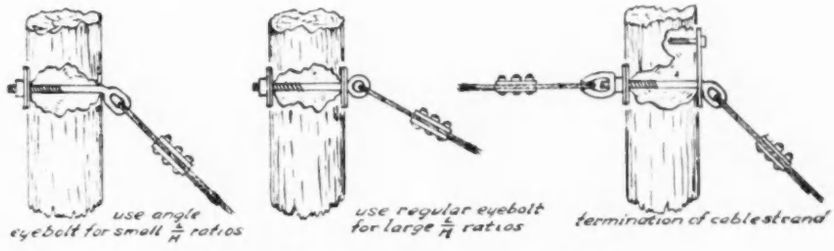


Fig. 13—Use of eye bolts for strand guys and dead-ends.

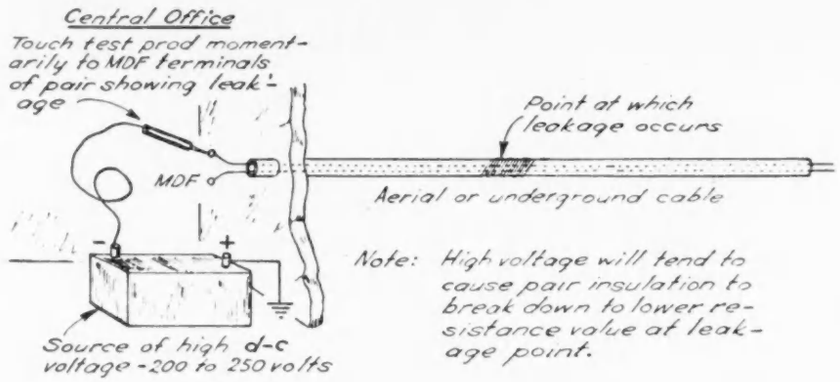

Central Office
Touch test prod momentarily to MDF terminals of pair showing leakage
MDF
Point at which leakage occurs
Aerial or underground cable
Note: High voltage will tend to cause pair insulation to break down to lower resistance value at leakage point.
Source of high d-c voltage - 200 to 250 volts

Fig. 14—Arrangement for making flash test on a high resistance fault in order to lower its resistance value.

Pole Grading

The importance of properly *grading* poles, across railroad tracks and other crossing points requiring high poles, is often overlooked. Proper grading of pole heights at cross-over points improves the appearance of the line and reduces the strain on the line wire which would otherwise exist due to an abrupt change in grade. The principle of pole grading is shown in Fig. 8.

Pole Corners

An eye sore occasionally seen in some telephone plants is a buckarm corner with a *rat nest* of jumper wires extending between arms and with the pole pulled out-of-line due to inadequate guying. Many buckarm corners could just as well be good secure two-pole corners. Fig. 9 illustrates the type of corner that will look good and can be depended on for trouble free service for a long period of time.

Standard Crossarm Pins and Fixtures

Fig. 10 which shows various types of pins, transposition brackets, etc., may be of help when placing orders for various items. When ordering material, be sure and get the right item for a given job. For example, it is a mistake to attempt to use a standard eight inch wood pin in place of the nine inch wood pin at transposition points where two piece transposition glass is used. Steel pins are sometimes recommended for long span river crossings and other similar special applications requiring high strength. Use standard galvanized hardware obtained from your telephone supplier. Hardware obtained from your local merchant will rust and will generally cost you more.

Fig. 15—Switchboard plug and jack gauges.

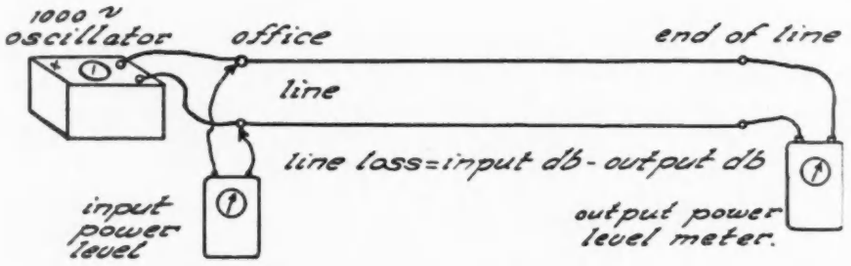


Fig. 16—Use of power level meters and thousand cycle oscillator for transmission test on telephone circuit.

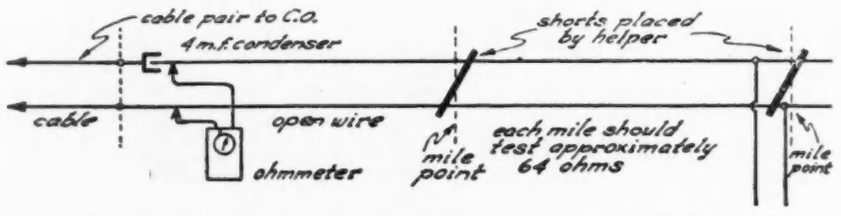


Fig. 17—Method of making mile-by-mile resistance checks of rural line wire.

Cable Bonds

Cable suspended in rings is often severely damaged due to *lightning burns* at the point where the lower part of the cable contact rings. This results where cable is not properly *bonded* to the messenger. If the cable is suspended in rings, bonds should be placed at frequent intervals throughout a cable plant. Fig. 11 illustrates one approved method of bonding the cable sheath to messenger. Soft tinned copper bonding ribbon should be used.

Protector Installations

Much has been written regarding the importance of connecting the ground strip of a group protector to the cable messenger. In spite of this some companies still connect the ground strip only to ground. Connection of the ground strip to the messenger results in an *equalization* of the voltage induced in a cable pair and the sheath the instant the arrestor blocks are over. This reduces the tendency for high induced voltages to create an arc between cable pair and sheath. This has been accurately determined by a series of experiments. Fig. 12 illustrates how the protector strip should be connected to the cable messenger.

Strand Dead-ends

The eyebolt method of dead-ending cable messenger and attaching guys to poles is now widely used by the larger companies. It has proven itself in service. It is easier to apply and it is less likely to damage the pole. It is adequately strong to do the job. Several methods of making eyebolt dead-ends are shown in Fig. 13.

Location of Cable Faults

High resistance grounds and shorts are often difficult to locate in telephone cable, particularly where a Wheatstone bridge is not available. Some testmen have found it practicable to *break down* or lower the resistance of the fault by *flashing* it with a source of high d-c voltage. The voltage source usually consists of a number of batteries connected in series and capable of delivering 200 to 250 volts. The voltage is applied, as shown in Fig. 14, by touching an insulated test prod against the wire or wires on which the leak is present.

A certain amount of hazard attends the use of a high voltage for this purpose. Do not overlook the fact that batteries connected in series can be dangerous if the voltage is much in excess of 200 volts.

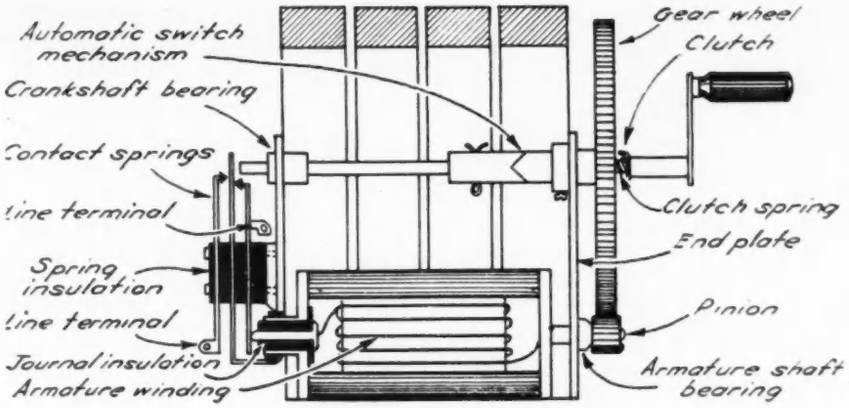


Fig. 18—Typical generator construction.

Once the fault is broken down by the flash voltage it can generally then be located with an inductive fault finder.

fect the service of many subscribers if not detected. Typical plug and jack gauges are illustrated in Fig. 15.

CABLE RESISTANCE CONVERSION VALUES			
GAUGE	FEET PER OHM PER WIRE	OHMS PER 1000 WIRE FEET	OHMS PER LOOP MILE
28	15.08	66.29	700
26	24.00	41.67	440
24	38.54	25.95	274
22	61.75	16.19	171
19	124.23	8.05	85
16	251.43	3.98	42

Fig. 19 — Useful conversion values for fault location work.

Plug and Jack Maintenance

Many companies operating manual boards do not have *plug* and *jack gauges* with which to periodically check the wear of these items. Most manufacturers are able to supply these gauges for the equipment which they manufacture. They should be used at periodic intervals to detect worn plugs and jack sleeves requiring replacement.

Worn jack sleeves or plugs are a frequent source of cutouts, poor transmission and noise. They should be detected and replaced as promptly as possible. This is particularly true of plugs as these are common to all subscribers' lines. A defective or badly worn plug may af-

Straight-away Transmission Tests

With the war over and test equipment again available, many telephone companies will wish to install standard transmission straight-away testing units. The purchase of a thousand cycle oscillator and two power level meters (calibrated in decibels) will enable straight-away tests. These tests are a true measure of the over-all talking efficiency of telephone circuits and enable the detection of transmission faults that might not be found by ordinary d-c testing methods. Fig. 16 illustrates this type of test.

Resistance Checks on Rural Wire

High resistance splices and jumper connections at terminals and corner poles are a common source of poor transmission and signalling on rural lines. By using a direct reading ohmmeter, as shown by Fig. 17, mile-by-mile checks can be made which will enable the location and correction of these trouble points. A 4.0 m. f. capacitor should be connected in series with the line at the junction of open wire and cable to prevent the central office drop or relay equipment from causing an erroneous reading. Iron wire should measure approximately 64 ohms per circuit mile.

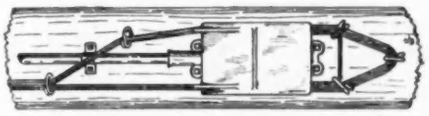


Fig. 21—Neat wiring on cable terminal poles.

Maintaining Telephone Generators

Magneto generators on a rural telephone are often disregarded by the repairmen when visiting rural stations. Generators require an occasional oiling (at least once each year) otherwise they turn hard and usually become loose on their mounting and they are a nuisance from the subscriber's standpoint.

The generator contact springs should be adjusted so that, depending on type, they short cut the generator armature when in the non-operated position, and connect it to the line terminal when in the operated position. If the action of the contact springs is not positive, the generator, as it is turned, may make and break the contact causing the generator to put out a series of short rings which

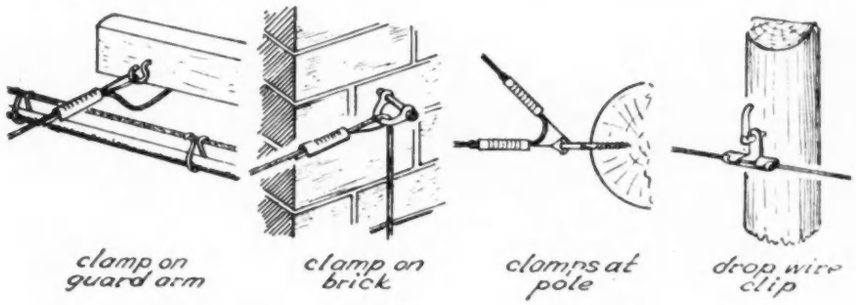


Fig. 20—Typical applications of drop wire clips and clamps.

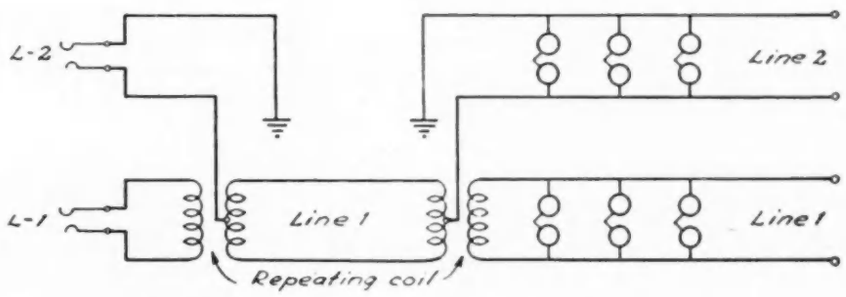


Fig. 22—Use of repeating coil to metalize portion of a grounded line.

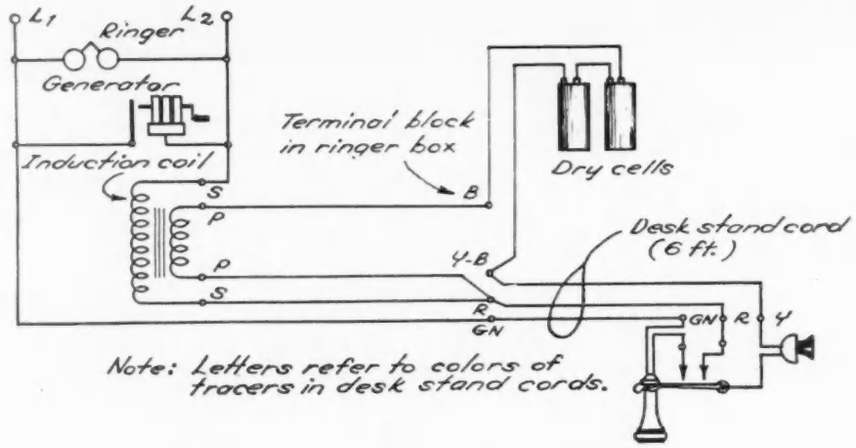


Fig. 23—Typical circuit of local battery test telephone.

will be confused with *rings on the line*, and probably disregarded by the operator.

A common, but often overlooked source of trouble in a magneto telephone, is the insulator bushing in the contact spring assembly of the generator (see Fig. 18). If a telephone on a rural line is not properly protected by arrestor blocks located near the point where the line enters the building and connected to a good ground by a short direct run of ground wire, lightning discharges may arc across the generator bushing and carbonize the bushing and render it conductive, causing the line to be partially grounded in the bushing. It is very difficult to locate this type of trouble as it is usually of the *come-go type* and will vary from day to day due to movement of the generator when it is cranked. This type of fault is fairly common on a grounded line exchange as both the line wire and the ground wire appear across the generator bushing. This trouble can readily be located with a direct reading ohmmeter.

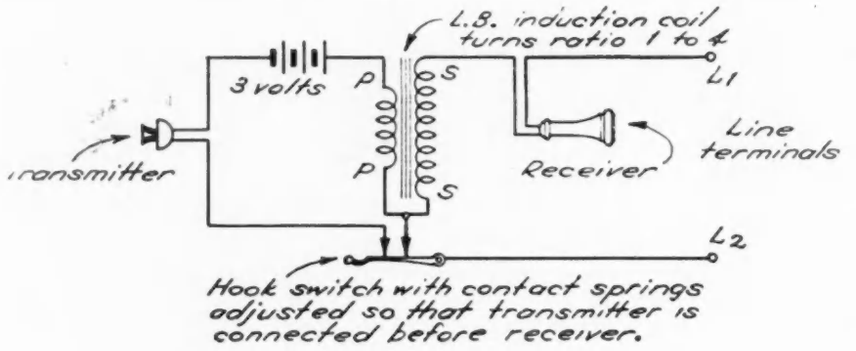


Fig. 24—Typical circuit of local battery wall telephone.

Cable Fault Conversion Values

In locating faults on telephone cable with the Wheatstone bridge it is necessary to convert the bridge reading into *feet per ohm* in order to get the actual location. The table which follows (Fig. 19) will prove useful for bridge work as it gives the values of *feet per ohm*, *ohms per thousand wire feet* and *ohms per loop mile* for the common sizes of cable. The values shown are for a temperature of 68 degrees Fahrenheit.

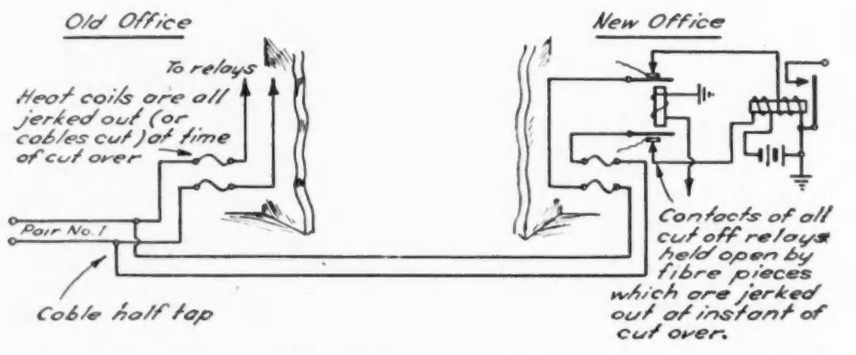

Old Office
To relays
Heat coils are all jerked out (or cables cut) at time of cut over
Pair No. 1
Cable half tap
New Office
Contacts of all cut off relays held open by fibre pieces which are jerked out at instant of cut over.

Fig. 25—Arrangement for instantaneous cutover from an old to a new telephone office.

Drop Wire Clamps and Clips

Porcelain insulators and tie wires for use in attaching drop wires to poles and buildings are almost as obsolete as the bustle. Fig. 20 shows the simplicity of the modern drop wire clamp and clips and some typical applications. If you are not yet using clips and clamps for your drop wire work, better start now.

Cable Wiring at Terminals

You can generally tell whether a telephone man is a good workman by examining the manner in which he runs his drops into cable terminals. A few bridle rings properly placed will do wonders for the wiring on a cable terminal pole. Fig. 21 shows how bridle rings can be used to *organize* the wiring feeding into the cable terminal.

Use of Grounded Phantom Circuit

Phantom circuits which are worked to ground are known as *grounded phantoms*. They are subject to the same objection as any grounded line, i. e., they are noisy and will crosstalk into other lines. Occasionally the grounded phantom is useful in temporarily providing an extra line without the necessity of stringing wire.

Fig. 22 shows an example of how three closely grouped subscribers were given temporary service by deriving a grounded phantom off of an existing metallic line. Ordinary talk-through ring-through repeating coils were used.

Local Batteries Telephone Circuits

Old time rural line instrument repairmen usually carry the simple local battery wall and desk set circuits in their heads and are able to adequately test and check the circuit without recourse to a diagram. But the beginner usually needs a reference circuit. Figs. 23 and 24 show respectively the circuits of the typical desk local battery desk and wall telephones. These can be cut out and carried in the pocket book for quick reference purposes.

Office Half Taps

The manner in which telephone service is instantly cut from an old to a new office by use of cable half taps may be of interest to those not familiar with this procedure. Fig. 25 illustrates a typical hookup. At the instant of cutover the men at the old office jerk out the heat coils or cut the cables on the old main frame. The men in the new office remove fibre strips which hold the contacts of the cut-off relay open.

(Please turn to page 92)

Handy Flashlight Test Unit

IN working with subscribers' telephones, switchboards, interior wiring, etc., the telephone maintenance man can always use a continuity tester to advantage. For most tests the ideal continuity tester is a direct reading ohmmeter with a self contained battery. As a supplementary tester, a home built unit, so small that it may conveniently be carried in the pocket, may prove of interest. This tester is easily made by modifying an ordinary pocket (fountain pen type) flashlight.

The bottom connection of the flashlight is disconnected and arranged so that it can be terminated in a small flexible wire or test terminal. A second connection is made by soldering a terminal or test wire to the flashlight case.

Fig. 1 illustrates the general features of the arrangement. This type of tester is ideal for all purposes except where the circuit under test has too high a resistance to permit enough current to flow through it to give a visible glow on the flashlight lamp.

Fig. 1—Pocket tester.

Buried Cable Plant

POWER companies are now experimenting with new types of feeder and distribution cable which can be placed directly in the earth. It is designed specifically for serving residential areas. It is being tried out principally in new residential developments where it can be placed at the time an area is under construction.

These experiments anticipate the day when civic pride may tend to force all overhead wires and cables underground.

The fact that power companies are giving consideration to the use of an underground distribution system for residential areas, indicates that the time may be ripe for telephone companies to give similar thought to the need for developing a low cost and completely underground residential cable and drop distribution systems.

Steel tape and jute armored cable offer a relatively simple means of getting the main elements of the exchange cable feeder and distributing plant underground. The problem in the telephone field is largely one of working out a satisfactory and relatively low cost subscribers' underground drop arrangement. It is of course possible to have the distribution cables underground and to utilize one or two riser poles in each block for aerial drop distribution. This type of construction is much less objectionable from a civic pride standpoint as it does eliminate the overhead construction over streets and minimizes the amount of poles and wire required along rear lot lines. However, it falls far short of the goal of a complete underground system.

The larger Independent companies will need to take the lead in setting up development projects which will work toward a complete underground distribution plant which can be installed at costs comparable with those of overhead plant.

Field of Use of TRUCK MOUNTED LADDERS

ONE of the characteristics of the telephone industry is its great stability. It is so stable that at times, and particularly in connection with outside plant, it seems that we are almost in a rut. More than fifty years ago our first lineman started raising himself to the top of telephone poles by the slow and laborious process of jabbing a piece of iron, strapped to the leg, into the pole. Arriving at the top of the pole, the lineman hangs precariously and in an uncomfortable position with nothing between him and eternity except a narrow leather belt.

It would seem that some new and more or less revolutionary approach to the pole climbing problem is needed. This does not mean that hooks should be entirely displaced, but that time and energy economies might be effected by the use of *truck mounted ladders.* Such ladders would be particularly effective in connection with the maintenance of city plants particularly with such operations as tree trimming, suspension of drops from cable mid-span positions, work on terminal poles, etc.

Some companies have already experimented with truck mounted ladders and have been highly pleased with the results obtained. Such units are now available through your suppliers. They are adequately designed from a strength standpoint and are convenient to use.

In considering the possible application of a truck mounted aerial ladder in your plant, you should take into account the actual labor-hour savings which a unit of this type would make possible. Careful observations over a period of time would be required to determine the ladder techniques to be used and the possible economies that would result from their use.

TOKYO

Editor's Note: Earle B. Blomeyer (son of Mr. and Mrs. E. C. Blomeyer, both well known in Independent telephone circles), served two and one-half years with the Signal Corps, with overseas service on Leyte and Luzon in the Philippines, and in Japan. Prior to his Army service Mr. Blomeyer was general managr of the Georgia Continental Telephone Company, a Class A company with headquarters in Monroe, Ga.

Upon his discharge from the Army in March, we asked Earle to write for us an account of telephone practices in Japan. Following is the first part of his two-part article on the subject; the second part will appear in our May issue. The illustrations are from photographs taken by him in Japan.

We think you will find this interesting, not only as a graphic picture of the telephone industry as it is in the large cities of Japan, but also as a study of Japanese character, habits and ways of thinking. Also, as a horrible example of what a governmentally owned telephone system can be.

JAPAN is a curious mixture of the new and the old, the ancient and the modern, and this contrast is emphasized in Tokyo, the center of both Oriental and European cultures. Here, the new, modern office buildings stand across the street from the ancient moat around the Emperor's palace. Here, people wearing kimonos and wooden clogs walk beside those dressed in a business suit and a grey fedora hat. Here, too, is a city served by a modern automatic telephone system, but receiving service so poor that only the long suffering Japanese people could put up with it. Without a doubt, the Jap exchanges are the darkest, the dirtiest, and have received the worst maintenance of any in the world. All during the four months I spent in Tokyo I was constantly amazed that any equipment could continue to give service under the conditions prevailing there.

Panel photo, top left (reading down) 1—Wartime bombproof Kojimachi exchange with two floors above ground and three below. 2—Lack of steel shutters spelled destruction for Sumida exchange by fire bomb raids. 3—Cable repair carts—Jap version. 4—Raid in March, 1945 resulted in cable racks and miscellaneous equipment on 1st floor of manual Sumida exchange.

I arrived in Tokyo the first of October, 1945, assigned to the Tokyo Central Telephone Office, for the supervision of maintenance of army telephones working out of the Jap commercial exchanges. In Tokyo the army did not install its own equipment or cables, but instead took over the telephone facilities that were found in the buildings occupied. Thus, in effect, the Army became a regular subscriber, working through regular Jap cables,

Calling

By EARLE B. BLOMEYER

Jap exchanges, and using Jap installation and maintenance men. Our job, then, was one of supervision of the Japs, rather than actually doing the maintenance work.

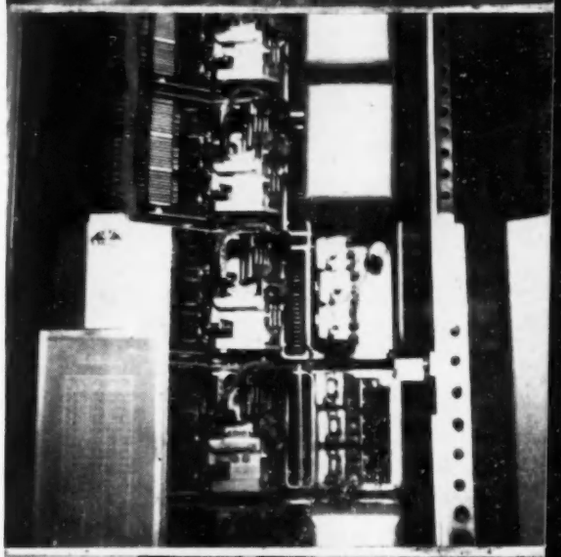
You can readily understand that in many cases it was harder to get the Japs to do the work than it would have been to do it ourselves, but this policy was necessary in order to reduce the number of army personnel required for occupation, and prevent tying up a large number of troops for work that the Japs could do. The greatest difficulty was trying to make them understand what we wanted, as even our interpreters did not know the technical terms involved in such a complex business.

We were fortunate, however, that in most cases the Japs were quite willing to cooperate. We had very little evidence, and no actual proof of any attempts to sabotage our efforts. When we first arrived there were a few cases of jumpers being cut, heat coils pulled for no apparent reason, and other minor troubles. At the time we suspected that these were deliberate attempts to interrupt our lines, but the cases were so scattered and haphazard in effect, and regular troubles were so numerous, that there was no proof of any subversive action. After observing the Jap methods for a longer period, I can understand how all of those suspicious cases of trouble could easily have been entirely accidental.

In design the Tokyo system is similar to that of any other large city. Before the war there were 40 exchanges in Tokyo proper, 5 manual and 35 step-by-step automatic. The general offices are located near the center of the city in the Tokyo Central Telephone Building, which also contains two step-by-step exchanges; 600 positions of toll board; and the toll terminal equipment, including toll testing, repeater and carrier equipment.

During the bombing of Tokyo, 4 of the manual exchanges were destroyed, and one of the automatic exchanges damaged. The other manual exchange has been dismantled since the bombings, as most of the buildings in this area were destroyed, and the few that were left could be served more economically from nearby automatic exchanges.

The original automatic installation in Tokyo was completed around 1926, and consisted of 10 exchanges in the central part of the city, including the two in the Tokyo Central Building. The equipment was manufactured and installed jointly by the Automatic Electric Co. of Chicago, and the Automatic Telephone Equipment Manufacturing Co., Ltd. of Liverpool, England, an affiliated company. Each company manufactured 5 exchanges.



Panel photo, top right (reading down) 1—Cable man testing for direction of fault with megger. 2—German design connector switches with cover removed from two switches (in Kojimachi bombproof exchange). 3—Cable man opening sheath in pole-to-pole search for fault (note safety belt). 4—Interoffice dial repeaters (Sumida exchange)—bull's-eye for the fire bombs.

The installation is of standard design, using rotary primary line switches and 4 selectors. A six digit number is used in dialing, rather than exchange names, thus eliminating letters on the dial card. Apparently exchange names were used in placing a call in a manual office, as both exchange name and exchange number prefix are listed in the directory. Rotary secondary line switches are used for trunk distribution between exchanges.

Everyone has heard how the Japs are excellent at imitation but poor at originating new ideas, and in general this statement is borne out by an inspection of the Tokyo telephone system. All additional automatic exchanges installed, or all additions to the original exchanges mentioned above, have been manufactured in Japanese factories, but there have been very few changes or improvements made in the original designs.

One of the most unusual modifications I saw was the complete elimination of level hunting connectors for service to PBX's requiring a large number of consecutive trunks. Connectors were eliminated by trunking straight from the 4th selector to the subscriber, with the use of additional relays in the 4th selectors to provide ringing, ring cut off, etc. This method saves the cost of connectors, but it is confusing in some ways to the subscribers, as the audible ring back tone comes after the 4th digit is dialed, and a busy signal would come after the 3rd digit if all trunks were busy. In the directory, 6 digits were still listed, but the last two were dummy numbers that had no control over the choice of trunks.

There were a few other minor modifications in the newer exchanges, but I was surprised to find that the line finder is not used at all, even in the newest exchanges, thus it is apparent that all of the exchanges built by the Japs have been copied almost exactly from the original installations.

THE AUTHOR

Earle B. Blomeyer

One of the amazing features of the telephone system at present is how little damage it suffered during the bombing of Tokyo. In the city itself an estimated 70% to 80% of the buildings were destroyed, but only four exchanges were destroyed and one other slightly damaged.

This comparatively light damage came in spite of the fact that, of necessity, the exchanges had to be scattered around all over the city, in many areas that were prime targets. I saw some factory districts that were almost completely leveled by fire bombs over an area of a square mile and more, yet in the middle of the destruction the telephone exchange still stood in operating condition. In one case, only 40 out of over 3,000 previous lines were still operating, but that was due to the fact that there were only 40 subscribers left for the exchange to serve.

I decided that this apparent invulnerability was due to three reasons: the fireproof construction of the buildings; the use of underground cable to a large extent; and the decision of the allied command to use fire bombs rather than high explosives. Without a doubt, high explosives would have destroyed any exchange by a direct hit or a near miss, or would have cut even underground cables. Fire bombs did not penetrate below the ground, and in most cases the exchanges were adequately protected against the raging fires and the terrific heat developed by the bombs. The exceptions were the 5 manual exchanges, and 4 of these were destroyed.

The solid construction of buildings, designed to prevent earthquake damage, paid big dividends during air raids. All buildings are built of reinforced concrete, two or three stories high, with walls a foot or more thick. One additional feature, sliding steel shutters, like an overhead garage door, outside of all windows and doors, played a large part in fire protection.

The importance of these shutters is shown in a comparison of the Fukagawa, Honjo and Sumida exchanges. All three of these exchanges were in the factory district East of the Sumida River, the target of our superforts in the first big raid on Tokyo, March 15, 1945. The entire area of over six square miles was completely devastated, leaving only a few scattered buildings to obstruct the view from one side of the area to the other. The heat was so intense during the worst part of the raid that water boiled in canals 20 to 30 feet wide; brick buildings burned like wood; and the steel framework of other buildings melted and ran in the street like lava.

Of those three exchanges, each had a concrete building, in addition the Fukagawa and Honjo exchanges had steel shutters. The Fukagawa exchange was undamaged, although it was the only building standing for a number of blocks. The Honjo exchange was damaged when fire bombs lit on the roof, burned through, and splashed burning gasoline jelly on some switches. It was not operating when I was in Tokyo due to the lack of both power and subscribers, but it will require only minor repairs to resume operations. The Sumida exchange was manual, and did not have steel shutters. The concrete walls are still standing, but the flames and heat entered the uncovered windows and completely destroyed all of the equipment.

The buildings themselves are strictly utilitarian, with very little attempt having been made to beautify them. All of the older exchanges have bare

(Please turn to page 95)

At entrance to the operator's rest room (toll board, Kojimachi exchange, Tokyo) the operators remove their shoes before stepping on the straw matting.

CONSTRUCTION COSTS

and Plant Accounting . . .

By F. F. McLAIR

PERHAPS it is an unusual circumstance when the exchange manager happens to be both an engineer and an accountant. However, the title of manager presupposes some knowledge of all phases of a business and both the economic planning of expenditures and properly accounting for them is of utmost importance.

The term *engineering cost study* implies a consideration of the relative economy of several different plans for accomplishing some desired end. Such a study should have as its basis first, the setting up of the various methods or plans by which some project may be handled, and second, a careful weighing of the true costs of each plan so that the ideal one, economy and adequacy considered, may be selected.

In purchasing even ordinary items, most of us mentally weigh costs and advantages of the several brands we may have to select from, but few of us stop to consider or weigh the economy over a definite period. We are influenced primarily by immediate costs rather than period or *true costs.*

If we would consider every project we are contemplating in the light of: 1-*Why do it at all?* 2-*Why do it now?* and 3-*Why do it this way?*, and would obtain an answer based on a sound engineering cost study, we should then get maximum results from our expenditures.

Cost Comparisons provide a basis for economic selection or for making a choice between two or more methods, routes or types of plant for a specific job. Decision as to use of open wire or cable, aerial or underground plant, dial switching or manual equipment can be made only with knowledge of both the *first cost* and the *carrying charges* which may be expected under each plan or type of construction. While the first cost of any project is, of course, important, particularly where there is lack of capital or adequate financing, it must be recognized that high annual carrying charges will soon offset the advantage of low first cost construction. This point is illustrated by Fig. 1.

Annual Charges are the recurring yearly expenses which accrue through ownership of plant but not including the expense of operation. The items usually included as annual charges are maintenance, depreciation, interest and taxes. A small amount to cover plant casualty is included by some companies.

Annual charges are more important in cost studies than are investment costs, as they express a measure of the efficiency of various alternative plans in terms of relative costs. That is, the expense of maintenance and the rate of depreciation show up in annual charges but they do not appear in investment costs. Annual charges, therefore, are usually deemed to be the determining factor in deciding which one of several alternate plans should be selected.

The engineer's method of selecting the most economic of several alternate plans is to determine the annual

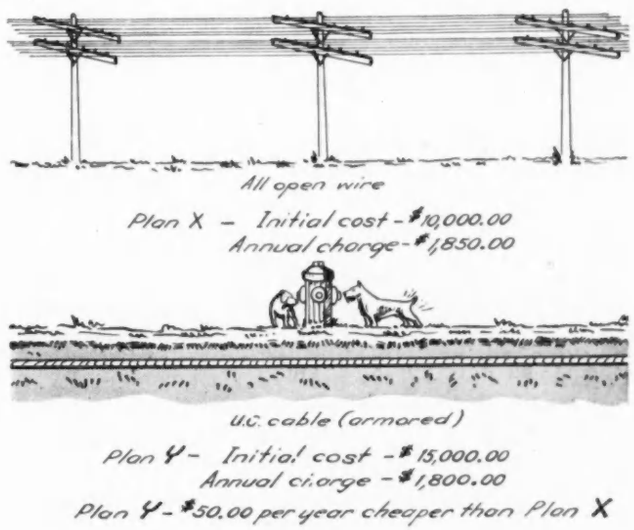

All open wire
Plan X – Initial cost - $10,000.00
Annual charge - $1,850.00
U.G. cable (armored)
Plan Y - Initial cost - $15,000.00
Annual charge - $1,800.00
Plan Y - $50.00 per year cheaper than Plan X

Fig. 1 — Annual charge cost comparison.

charges for each plan, for a certain number of years, usually the expected service life of the plant, and convert these charges to a *present worth basis.* This method permits such items of expense to be viewed as one expenditure and provides a more direct comparison between the different plans.

Expenditures set up on a present-worth basis give a true picture of the total costs for some assumed study period. These costs recognize the fact that delayed expenditures represent interest saved. All investment costs are converted by means of the reciprocal of the compound interest factor to equivalent costs; and in this form various alternative plans involving expenditures made at different periods may be directly compared.

Typical annual charges for each class of plant and which are, of course, only representative of the experience of an average company are given in Table No. 1.

Table No. 1—Typical Annual Charges on Various Types of Plant

Note—The following annual charge figures are typical values based on operations in one area. These figures should be used only as a guide as actual annual charge experience in any specific case may be substantially higher than the figures given.

Type of Plant	Estimate Service Life	Annual Charge (% of invest.)
Exchange aerial cable	17 years	14.0
Toll aerial cable	17 "	18.0
Buried tape armored cable	25 "	14.5
Exchange aerial wire	16 "	23.0
Toll aerial wire	25 "	16.0
Exchange drop wire	6 "	27.5
Exchange pole line	20 "	14.0
Toll pole line	20 "	13.0
Exchange U.G. cable	22 "	12.0
Exchange U.G. conduit	50 "	10.0
Automatic C.O.E.	25 "	15.0
Manual C.O.E.	20 "	17.0
C.O. buildings	30 "	14.0

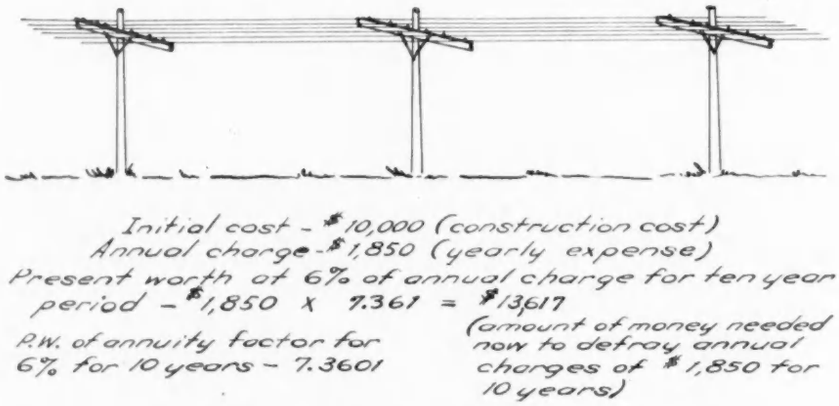

Initial cost - $10,000 (construction cost)
Annual charge - $1,850 (yearly expense)
Present worth of 6% of annual charge for ten year period - $1,850 x 7.361 = $13,617
(amount of money needed now to defray annual charges of $1,850 for 10 years)
P.W. of annuity factor for 6% for 10 years - 7.3601

Fig. 2—Illustration of the use of present worth of annual charge factors.

Present worth is the current value of a sum of money to be expended at some future date. It is the sum required to be presently in hand which with compound interest accumulations will produce a specific amount at the end of *n-years,* or necessary now to take care of a yearly annuity (annual charges) for a specific period.

The present worth, of course, depends largely upon the interest rate selected as proper for the individual company. If the company is able to earn a return of 7% on its investment, the same rate would be proper in determining present worth. With the low interest rates generally prevalent, 6% is probably a maximum that could be justified at the present time.

To illustrate, supposing a sum of $1,000 is required for a specific plant purpose at the end of fifteen years and that the money now on hand can be invested to earn 5% compound interest. It is found that at this rate any sum of money will approximately double in the fifteen-year period. Thus, the present worth of the $1,000 is approximately $500. This point is shown pictorially by Fig. 2 for a sum of money to be expended as annual charges over a ten-year period.

Maintenance expense is the cost of repairs necessary to maintain plant and keep it in satisfactory operating condition or to prolong its service life.

Maintenance expense includes replacement of all minor items of plant which are not units of property as outlined in the *Uniform System of Accounts.* Replacement of broken insulators, crossarm pins, pole brackets, drop wires, inside wires, etc., are properly chargeable to maintenance expense. The cost of pulling slack wire, resetting or straightening poles, clearing trouble and trimming trees and other such recurrent work are also major items of expense chargeable to maintenance.

As mentioned previously, maintenance expense is largely dependent on the type of construction and an appreciable saving in maintenance can be made by use of properly designed plant and good construction methods.

Depreciation is the loss in value of plant resulting from wear, age, casualty, obsolesence or public requirement. Even if the best maintenance practices are employed all material things may be expected to eventually wear out. Units of plant will reach the point when they no longer will serve the purpose for which they were designed. The life of a pole line becomes exhausted and must be rebuilt with new material. A cable becomes inadequate and must be replaced to provide greater capacity even though it may be in good physical condition. Perhaps subscribers demand a better type of service and existing magneto equipment must be discarded in favor of dial. Such things are inevitable and depreciation is an actuality for which provisions must be made. Like maintenance expense, however, it can be partially controlled by careful planning, good construction methods and the purchase of equipment and supplies from a reliable source.

Fig. 3—Make-up of construction unit costs.

Service life is the period of time during which an item of plant remains in service. Nothing has more effect on depreciation than the service life of plant. The longer its life, the slower its depreciation. The more rapidly it deteriorates the sooner the money for its replacement must be accumulated. This again is influenced by the type of construction employed. As shown in Table No. 1 (annual charge table) the life of cable placed in conduit will be considerably greater than for an aerial cable while the life of the conduit system itself will be as great as that of two or three cables.

Estimation of the cost of any plant project is usually accomplished in either of two ways which are known respectively as the *cost unit method* and the *detailed labor and material method.* The cost unit method is best suited for making cost comparisons because of its greater convenience. While not so accurate as the other method, there is a substantial saving in time and if the units are carefully prepared, they are sufficiently accurate for the purpose.

Cost units are unit prices established as the *cost in place* for each item. As illustrated by Fig. 3, these should include all material, labor, supervision and miscellaneous expenses incident to construction of the particular items. Cost units are made up on the basis of past experience in performing various operations. For cost comparisons where plant retirements are involved, cost units covering the labor for removal of plant are also useful. Each company will need to make up unit cost data based on its own experience.

The Detailed Labor and Material Method is recommended for use in preparing specific estimates covering construction proposals. As its name implies, this method involves detailed listing and pricing of material and computation of the amount of time which will be employed by each class of workman. Each workman's time is computed at the hourly rate of pay; board and lodging expense is included; provision is made for truck and traveling expense and supervision and overhead expense.

This method is preferable for specific estimate compilation as it permits basing the time estimate on known factors pertinent to the particular project. Allowance should be made for weather and road conditions, season of the year, time required in traveling and local rates for board, etc.

Specific estimates provide a method for authorizing and supervising the construction operations of the larger telephone companies. The estimate is prepared after the method and plan for doing the work has been selected from various alternate proposals. The estimate is intended to present the facts on which the management must base its authorization of the proposal and it provides both plans and specifications for doing the work and properly accounting for the expenditures. The estimate should state the necessity for the work, what will be accomplished by the proposal, why it is recommended to be done at this time and in the manner selected.

ACCOUNTS CHARGEABLE, ESTIMATE No._____

ACCOUNTS	GROSS ADDITIONS	PLANT DISPLACED	NET ADDITIONS	SALVAGE	COST OF REMOVING	MAINTENANCE	
						GROSS	SALVAGE

Fig. 5—Accounts chargeable estimate form.

DETAIL SHEET—REMOVALS, ESTIMATE No._____

TYPE OF PLANT ACCOUNT

DETAIL OF UNITS	PLANT DISPLACED			SALVAGE		
	QTY.	PRICE	AMOUNT	QTY.	PRICE	AMOUNT
	TOTAL PLANT DISPLACED			TOTAL SALVAGE		

LABOR—NATURE OF WORK	CLASS OF LABOR	HOURS	PRICE	AMOUNT

TOTAL LABOR
*OVERHEAD EXPENSE ____ % OF LABOR
OTHER EXPENDITURE

* COMPRISES—PLANT SUPERVISION, TOOL AND ENGINEERING EXPENSES.

TOTAL ESTIMATED COST OF REMOVING

Fig. 6—Detail sheet (removals).

THE OMEGA TELEPHONE & TELEGRAPH COMPANY

AUTHORIZATION, ESTIMATE No._____

TITLE

DATE 19 DISTRICT

FIXED CAPITAL ACCOUNTS:
GROSS ADDITIONS $ PLANT DISPLACED $ NET ADDITIONS $

RESERVES:
REMOVING $ PLANT DISPLACED $ SALVAGE $ NET TO RESERVES $

WIRING GAIN & LOSS: WIRING LOSS $ WIRING GAIN $ NET $

GROSS EXPENDITURE $ SALVAGE & WIRING GAIN $ NET REQUIREMENT $

MAINTENANCE: (TO BE EXPENDED IN ADDITION TO THE ABOVE)
GROSS $ SALVAGE $ NET $

WORK TO BE STARTED ABOUT 19 AND COMPLETED ABOUT 19

NATURE AND NECESSITY OF WORK:

APPROVED	DATE	APPROVED	DATE
		EXECUTIVE COMMITTEE BY: SECRETARY	

Fig. 4—Authorization estimate form.

The estimate should show in detail under each account and class of plant the following:

(1) Items of material (price and total amount)
(2) Hours of labor (hourly rate and amount)
(3) Supply expense
(4) Supervisory expense
(5) Board and lodging
(6) Truck expense
(7) Freight and drayage
(8) Items of plant removed
(9) Retirement and salvage values and removal cost
(10) Maintenance expense including material used and recovered
(11) Labor and miscellaneous

Typical forms used in the preparation of specific estimates are shown in Figs. 4, 5, 6, 7, 8, and 9.

Retirement value is the book cost or value at which a unit of plant is carried on the company's books and is the amount which must be credited to the plant account when such item is retired from service.

SUMMARY FOR COMPLETION REPORT, ESTIMATE NO._____

PLANT UNITS AND LABOR DETAIL				EXPENDITURES		
ITEM	ACTUAL	ESTIMATED		ACTUAL	ESTIMATED	% DIFF.*
CHARGEABLE TO						
			MATERIAL SUPPLY EXPENSE LABOR OVERHEAD EXPENSE OTHER EXPENDITURES FRT. AND CARTAGE TOTAL			

PLANT DISPLACED					ACCOUNT	SALVAGE		
ACTUAL		ESTIMATED		% DIFF.*		ACTUAL	ESTIMATED	% DIFF.*

* DEFICIT IN RED. ** DISBURSING PRICE OF MATERIAL USED AND AVERAGE HOURLY RATE OF LABOR.

Fig. 8—Summary sheet for completion report.

If items of material are to be reused they should be salvaged at their original cost, and if this is not known, at the current cost of new material of like kind and quality. If the recovered material is to be junked, the salvage price should be that at which such items can be sold.

DETAIL SHEET - MAINTENANCE - ESTIMATE NO._____

FIELD CODE_____									
MATERIAL				LABOR				EXPENDITURE SUMMARY	
	QTY.	PRICE	AMOUNT	CLASS	HOURS	PRICE	AMOUNT	ITEM	AMOUNT
								MATERIAL SUPPLY EXPENSE LABOR OVERHEAD EXPENSE* OTHER EXPENDITURES	
								GROSS EXPENDITURES SALVAGE NET EXPENDITURES	

Fig. 7—Detail sheet (maintenance).

Retirement units are usually computed on a cumulative basis and are determined by distributing the book values to the plant items in each account. A simple method of computing such units is to apply construction cost units to the total plant items in each account and then make such adjustments on a percentage basis as are necessary to agree with the book value. These units should be adjusted yearly to maintain them on a current cumulative basis.

Use of proper retirement units is essential to adequate and proper plant accounting. Unless the correct values are used in making retirements, the book values are soon distorted and do not reflect either the original cost or value of the plant in service.

Salvage Value is the worth, either for junk or re-use, of material recovered through plant retirement. Net salvage is the gross value of such material less the cost of plant removal. In some instances net salvage will be a minus quantity because the cost of removal exceeds the gross salvage value.

Typical Cost Comparison Case

A typical case of cost comparison or economic selection is the use of open wire versus cable. For instance, a twenty wire rural lead adjacent to the local exchange boundary requires rebuilding and both the pole line and the open wire are in such condition that complete replacement is required. Decision must be made as to whether the replacement should be made with open wire circuits or with aerial cable.

Table No. 2—Present Worth Multipliers

Formula: $PW = \frac{1}{(1+i)^m}$

Years (n)	i=3%	i=4%	i=5%	i=6%	i=7%
1	.9709	.9615	.9524	.9434	.9346
2	.9426	.9245	.9070	.8900	.8734
3	.9151	.8890	.8638	.8397	.8163
4	.8885	.8548	.8227	.7921	.7629
5	.8626	.8219	.7835	.7473	.7130
6	.8375	.7903	.7462	.7050	.6663
7	.8131	.7599	.7107	.6651	.6227
8	.7894	.7307	.6768	.6274	.5820
9	.7664	.7026	.6446	.5919	.5439
10	.7441	.6756	.6139	.5584	.5083
11	.7224	.6496	.5847	.5268	.4750
12	.7014	.6246	.5568	.4970	.4440
13	.6809	.6006	.5303	.4688	.4150
14	.6611	.5775	.5051	.4423	.3878
15	.6419	.5553	.4810	.4173	.3624
16	.6232	.5339	.4581	.3936	.3387
17	.6050	.5134	.4363	.3714	.3166
18	.5874	.4936	.4155	.3503	.2959
19	.5703	.4746	.3957	.3305	.2765
20	.5537	.4564	.3769	.3118	.2384
21	.5375	.4388	.3389	.2942	.2415
22	.5219	.4219	.3418	.2775	.2257
23	.5067	.4057	.3256	.2618	.2109
24	.4919	.3901	.3101	.2470	.1971
25	.4776	.3751	.2953	.2330	.1842

Table No. 3—Compound Interest Multipliers

Formula: $(1 + i)^n$

Years (n)	i=3%	i=4%	i=5%	i=6%	i=7%
1	1.0300	1.0400	1.0500	1.0600	1.0700
2	1.0609	1.0816	1.1025	1.1236	1.1449
3	1.0927	1.1249	1.1576	1.1910	1.2250
4	1.1255	1.1699	1.2155	1.2625	1.3108
5	1.1593	1.2166	1.2763	1.3382	1.4025
6	1.1940	1.2653	1.3401	1.4185	1.5007
7	1.2299	1.3159	1.4071	1.5036	1.6058
8	1.2668	1.3686	1.4775	1.5938	1.7182
9	1.3048	1.4233	1.5513	1.6895	1.8385
10	1.3439	1.4802	1.6289	1.7908	1.9671
11	1.3842	1.5395	1.7103	1.8983	2.1048
12	1.4258	1.6010	1.7959	2.0122	2.2522
13	1.4585	1.6651	1.8856	2.1329	2.4098
14	1.5126	1.7317	1.9799	2.2609	2.5785
15	1.5580	1.8009	2.0789	2.3966	2.7590
16	1.6047	1.8730	2.1829	2.5405	2.9522
17	1.6528	1.9480	2.2920	2.6928	3.1588
18	1.7024	2.0258	2.4066	2.8543	3.3799
19	1.7535	2.1068	2.5269	3.0256	3.6165
20	1.8061	2.1911	2.6533	3.2071	3.8697
21	1.8603	2.2788	2.7860	3.3926	4.1406
22	1.9161	2.3699	2.9253	3.6035	4.4304
23	1.9736	2.4647	3.0715	3.8197	4.7405
24	2.0328	2.5633	3.2251	4.0489	5.0724
25	2.0938	2.6638	3.3864	4.2919	5.4274

Further growth is not anticipated and a 15 pair 22 gauge cable will provide adequate circuit capacity and satisfactory transmission.

The service life of cable approximates that for both wire and pole line. A service life of twenty years is therefore assumed for all three classes of plant and is taken as one period of study. The study sets up as follows:

Plan No. 1—Open Wire

Item	Cost in Place	Annual Charge Rate	Annual Charge Amount
Pole line (1 mile)	$ 400.00	14 %	$ 56.00
Cross arms (2 per pole)	170.00	14 %	23.80
Iron wire (20 miles)	450.00	27.5%	123.75
Total	$1,020.00		$203.55

Annual charge of $203.55 for twenty-year period converted to present worth @ 6% interest = $2334.70. This, plus the first cost of $1020.00 totals $3354.70 as the total cost of open wire construction for the twenty-year period.

The conversion of the annual charge to a present worth basis requires the use of the *present worth of annuity multipliers* given in Table No. 4. At 6% interest for a twenty-year period the multiplier is 11.4699. Therefore: $203.55 x 11.4699=$2334.70. Thus if we are to spend $203.55 each year for twenty years, the present value of this expenditure can be viewed as $2334.70.

The annual charge of $203.00 for the twenty-year period converted to present worth (Table No. 4) @ 6% interest = $2328.39. This plus the first cost of $1450.00 totals $3778.39 as the total cost of the cable plan for the twenty year period.

We thus find a total cost difference of $423.69 in favor of open wire construction.

In some instances it is necessary in making an economic selection of several alternate plans to consider the total operating costs as well as annual charges. This is particularly true in considering dial switching versus manual equipment where traffic expense is a large factor.

Plan No. 2—Aerial Cable

Item	Cost in Place	Annual Charge Rate	Annual Charge Amount
Pole line (1 mile)	$ 250.00	14%	$ 35.00
Aerial cable (1 mile 15 pr. 22 ga. and terminal)	1,200.00	14%	168.00
Total	$1,450.00		$203.00

Cost Comparison of Dial vs. Manual C.O.E.

As an example of a cost study of dial versus manual central office equipment let us consider an exchange of 250 stations, approximately one half of which are local and the remainder rural subscribers. We will assume that magneto manual service is now furnished and that a rented building will be used. The C.O.E. requires replacement and decision must be made regarding replacement with magneto equipment or conversion to dial service. Our first step is to determine what our investment will be under each plan.

Item	Plan No. 1 Mag. Eqpt.	Plan No. 2 Dial Eqpt.
Central office equipment	$ 2,500.00	$ 7,500.00
Station equipment	6,250.00	6,250.00
Pole line	9,000.00	9,000.00
Aerial cable	3,000.00	3,000.00
Aerial wire	5,000.00	5,000.00
Office furniture	250.00	—
Total	$26,000.00	$30,750.00

Our second step is to determine the carrying charges and operating expenses which may be expected under each plan.

Item	Plan No. 1 Mag. Eqpt.	Plan No. 2 Dial Eqpt.
Depreciation	$ 780.00	$ 922.50
Repairs to C.O.E.	125.00	225.00
Repairs to station eqpt.	625.00	750.00
Repairs to outside plant	700.00	840.00
Traffic expense	2,000.00	200.00
Commercial and gen'l expense	750.00	350.00
Rent	250.00	75.00
Taxes	390.00	461.25
Interest @ 6%	1,560.00	1,845.00
Total	$7,180.00	$5,668.75

Item	Plan No. 1 Mag. Eqpt.	Plan No. 2 Dial Eqpt.
Annual charge for 20-year period converted to present worth	$ 82,347.42	$65,014.89
Plant investment	26,000.00	30,750.00
	$108,347.42	$95,764.89

OMEGA TELEPHONE & TELEGRAPH CO.

FINAL COMPLETION REPORT, ESTIMATE NO._____

TITLE

DATE 19 DIV STATE

ACTUAL; GROSS $		SALVAGE & WIRING GAIN $	NET $
AUTHORIZED, GROSS $		" " $	NET $
* DIFFERENCE $		$	$
* VARIATION	%		% %

FIXED CAPITAL ACCOUNTS

	GROSS	PLANT	NET
ACTUAL; ADDITIONS $		DISPLACED $	ADDITIONS $
AUTHORIZED " $		" $	" $
* DIFFERENCE $		$	$
* VARIATION	%	%	%

RESERVES (ACTUAL)		PLANT	
REMOVING $		DISPLACED $	SALVAGE $ NET $
EX. REPAIRS $			SALVAGE $ NET $
			ACTUAL; NET TO RESERVES $
			AUTHORIZED; " " " $
			* DIFFERENCE $
			* VARIATION %
WIRING GAIN AND LOSS (ACTUAL)		WIRING LOSS $	WIRING GAIN $ NET $
MAINTENANCE ACTUAL, GROSS $			SALVAGE $ NET $
EST., GROSS $			" $ NET $

WORK COMMENCED 19 AND COMPLETED 19

APPROVED	DATE	APPROVED	DATE
		EXECUTIVE COMMITTEE BY:	
		SECRETARY	

* Show Deficit in Red

Fig. 9—Final completion report.

Our cost comparison shows that under plan No. 2 we will effect a cost saving of $12,582.53.

Available Capital May Control Selection

Assuming all feasible plans have been placed on an equivalent true cost basis, then the selection of the ideal plan is merely one of picking the plan having the lower equated annual charges. In some cases it may be found that available capital may dictate the selection of a plan involving higher annual charges or higher period investment costs because of the lower initial capital expenditure under the plan selected.

It should be recognized that a cost study is not the only basis on which to make a decision of this kind. It is, however, a necessary preliminary to prudent investment and an instrument of good management.

Proper accounting for expenditures is essential to maintenance of adequate and dependable records. Its effect on both the capital and maintenance accounts as well as the depreciation reserve is of great importance. Not only is it indispensable to management for supervisory and control purposes but its effect on current operating expenses, earnings and taxes is such that the financial structure and operating success of the company is dependent on it. To a large extent even the gross income is affected by the accounting system since the plant accounts are a factor in the determination of exchange service rates.

Plant accounting necessarily begins in the field. It is begun by the installer, the foreman or other workman when he prepares his *daily work report.* Proper reporting of work performed and material used and recovered is the first requirement of accurate accounting. Not only is it necessary that all time and material be listed on the work report, but it is necessary also, that proper explanation be made of the work performed and the use to which such materials are put. In many instances such explanation determines whether the labor and material shall be booked to capital accounts or as maintenance expense. Also, there are many instances in which the same item of material is used under two or more classes of plant. Messenger strand, for instance, is used to support cables and for overhead and down guys. In one case it is chargeable to the aerial cable account but when used for guys it is properly chargeable to pole line. If strand is reported without any explanation of its use, the accountant is unable to determine to which account it should be charged.

Accountants Must Be Alert

In day-to-day routine work, the accountant must necessarily rely entirely on the work report to determine

(Please turn to page 98)

Table No. 4—Present Worth of Annuity Multipliers

Years (n)	i=3%	i=4%	i=5%	i=6%	i=7%
1	0.9709	0.9615	0.9524	0.9434	0.9346
2	1.9135	1.8861	1.8594	1.8334	1.8081
3	2.8286	2.7751	2.7232	2.6730	2.6243
4	3.7171	3.6299	3.5459	3.4651	3.3872
5	4.5797	4.4518	4.3295	4.2124	4.1002
6	5.4172	5.2421	5.0757	4.9173	4.7665
7	6.2303	6.0020	5.7864	5.5824	5.3893
8	7.0197	6.7327	6.4632	6.2098	5.9713
9	7.7861	7.4353	7.1078	6.8017	6.5152
10	8.5302	8.1109	7.7317	7.3601	7.0236
11	9.2526	8.7605	8.3064	7.8869	7.4987
12	9.9540	9.3850	8.8632	8.3838	7.9427
13	10.6349	9.9856	9.3936	8.8527	8.5576
14	11.2961	10.5631	9.8986	9.2950	8.7455
15	11.9379	11.1184	10.3796	9.7122	9.1079
16	12.5611	11.6523	10.8377	10.1059	9.4466
17	13.1661	12.1657	11.2741	10.4773	9.7632
18	13.7535	12.6893	11.6896	10.8276	10.0591
19	14.3238	13.1339	12.0853	11.1581	10.3356
20	14.8775	13.5903	12.4622	11.4699	10.5941
21	15.4150	14.0292	12.8211	11.7641	10.8355
22	15.9369	14.4511	13.1630	12.0416	11.0612
23	16.4436	14.8568	13.4886	12.3034	11.2722
24	16.9355	15.2470	13.7986	12.5504	11.4693
25	17.4131	15.6220	14.0939	12.7834	11.6536

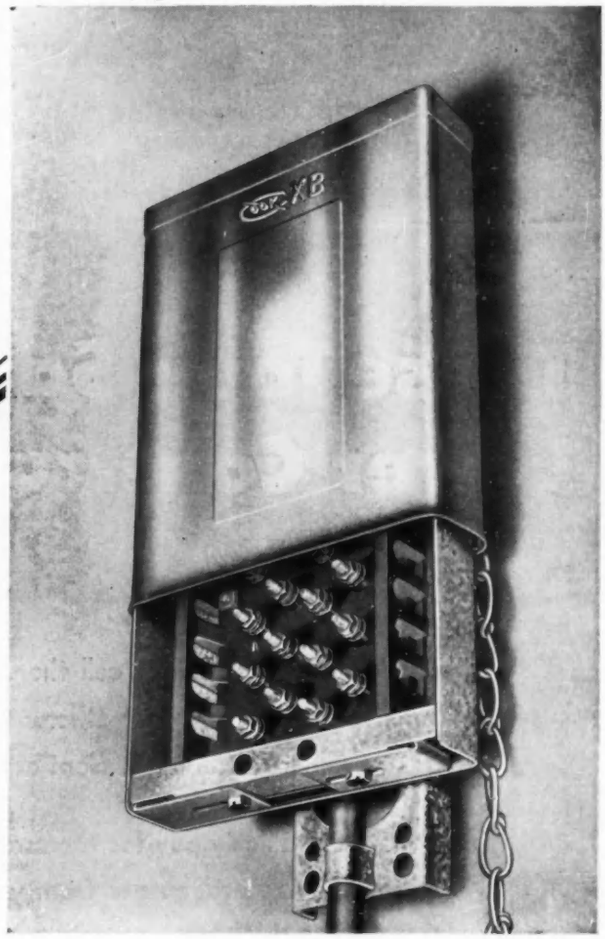
TYPE

XB

CABLE TERMINAL

by

COOK



SAVES THROUGH LESS INSTALLATION TIME AND LONGER SERVICE

The Cook XB Cable Terminal (unprotected) is available in 6 to 26 pair sizes, and offers many important advantages in construction, wiring features, maintenance savings and installation characteristics. Patent metal guards exclude snow, rain, dirt and insects at the drop wire openings. The patented plastic faceplate and insulated fanning strip are molded in one piece. Raised stud mountings eliminate surface leakage. Patented cable entrance and cable holding sleeve provided secure and tight cable joint. The compound is completely filled by an exclusive moisture-proofing process that insures against shorts and grounds by permanently positioning the cable pairs. Heavy reversible zinc hood permits mounting with stub from either top or bottom.

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LIGHTWEIGHT 6½ LBS.

PORTABLE

SIZE: 5½" x 4¾" x 3"

2000-FOOT BEAM

TWO-WAY TOGGLE SWITCH

TWO BULBS

PATENTED CONTACTS NO WIRES

WILL OPERATE ON ONE OR TWO 6-VOLT BATTERIES

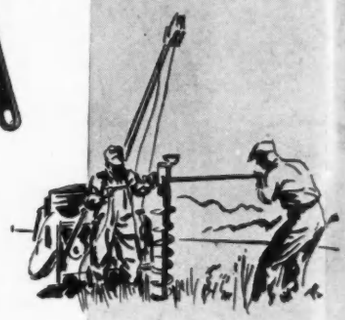
PARABOLIC REFLECTOR

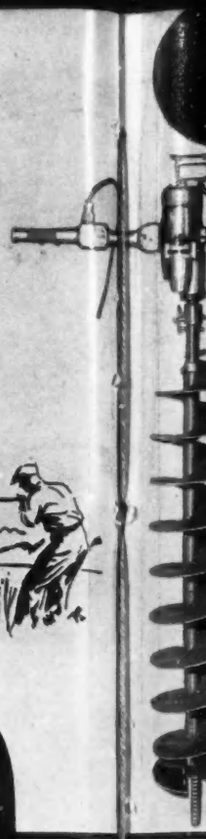
BIG BEAM LIGHT

A small, handy electric light that fills every emergency lighting need for the telephone company. Throws powerful 2000-foot beam.

COFFING HOIST

Lightweight construction—easily carried up a pole, for pulling wire, messengers, etc. Enables one man to lift or pull more than a ton!





These Tools Save Manpower... Lower Construction Costs!

"MANSAVERS", you might call them, because these husky tools enable one or two men to do the work that otherwise requires more. They save time, and cut out much of the hardest labor in plant construction and maintenance.

These tools can quickly pay for themselves in lowered construction costs. Look them over here—and order ***now*** from your Automatic Electric Supply Catalog.

OLDING

Wo en stand
for asy stowin
hard ood, stee

CAPSTAN PULLEY BLOCK

An old favorite tool for attaching guys, raising and placing poles, pulling cable, and general use in line construction.

LOG CHAIN

Fourteen-foot chain, with grab-hook at one end, slip-hook at other end. A safe, dependable hitch for heavy lifting or towing.

CROW AND DIGGIN BARS

Octagon bars made of spec alloy heat treated tool steel. Double eveled cut ting blade at one end, po t at othe end.

THESE TWO ARE NEW, TOO!

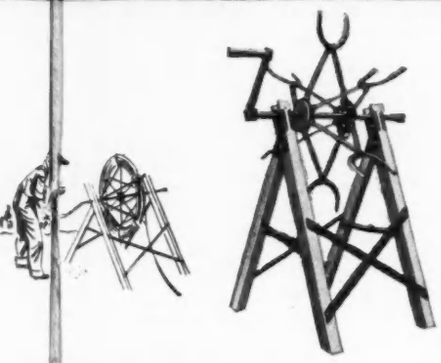
KA-MO EARTH DRILL

Drills 8- to 12-inch-diameter holes in clay, mud or sand—ends digging drudgery, cuts digging time 50% to 75%. Powered by a portable gasoline-engine-driven generator.

NEALE CABLE SPINNER

"Spins" cable and strand together, eliminating rings and ring-cutting, and forming a continuous bond between cable and strand, for increased protection against lightning, power crosses and tree damage.

Ask for Complete Information and Prices



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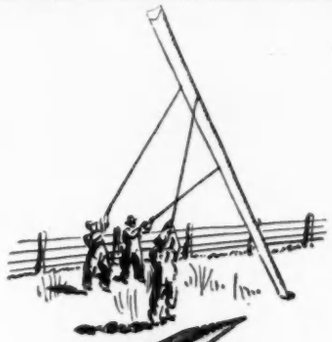
Wooden stand and metal reel fold up for easy stowing. Ruggedly built of hardwood, steel and malleable iron.



DICKE PIKE POLES

With unique "Stick-Tite" pike, which goes in easily, locks in place for maximum safety, yet comes out with a twist of the hand.

SIMPLEX POLE JACK

One man—unaided—can push poles back in line quickly and safely, with this husky tool. Use also for tightening guys, pulling cable, etc.

GGING BARS

special alloy heat-double-beveled cut-nd, point at other

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News Briefs...

Cuts Rural Phone Cost

The Illinois Commerce Commission has announced a new schedule which reduces the cost of Illinois Bell Telephone company service to new subscribers in rural areas. Under the new rules the company, at its own expense, will extend a line three-fourths of a mile along a highway to serve a single farm customer. Heretofore, the limit has been a half mile. Time payments also are provided where farmers must pay for longer extensions.

Increase Granted

The Laporte (Minn.) Telephone Company was authorized March 27 by its state commission to increase its rural switching service rate from $3 per year net to $4.80, effective the first billing following April 30, 1946. The applicant had proposed a rate of $6 per year net; although the commission felt the $3 rate was confiscatory to the property of the company. they felt the proposed rate also unreasonable and decided that $4.80 for rural switching service would be reasonable and not produce more than a fair return on the property.

Central Kansas Sold

United Utilities, Inc., Abilene, Kansas, completed contracts on March 8 to buy the property of Central Kansas Telephone Company, Topeka, Kansas, with telephone exchanges in twenty cities in Southeastern Kansas.

Total telephones in the territory served are approximately 6,600, including such cities as Osawatomie, Garnett, Oswego, Waverly and Mound City.

Gross revenues of the company in 1945 were $166,000.

With this acquisition, United Utilities, Inc., now operates, thru its telephone subsidiaries, 152,000 telephones located in eight states. The company also serves 10,000 electric and gas customers in Northwestern Kansas. Total gross revenue in 1945 was approximately $6,620,000.

Col. L. D. Densmore Resumes Duties

Col. L. D. Densmore has returned from Italy and resumed his civilian duties with the Central Electric & Gas Company utility system, Sioux Falls, S. D. Prior to re-entering the services of the armed forces in November, 1940, he was Centrals' general manager.

L. D. Densmore

Col. Densmore has accepted an assignment as operating head of the company's telephone properties located in the states of Virginia, West Virginia and North Carolina, according to an announcement by R. A. Phillips, vice president of the firm. Col. Densmore will locate at Charlottsville, Virginia. As vice president and general manager of Virginia Telephone & Telegraph Company and eastern division manager of Central Telephone Company's property in that territory, he will have supervision over fifty-one telephone exchanges.

United Nations Telephone Needs

A force of thirty U.N.O. employees working around the clock is required to operate the 12-position multiple switchboard installed to take care of the telephone needs of the United Nations Organization in its temporary headquarters at Hunter College. The New York Telephone Company reports that the switchboard serves 500 telephones and is connected by 75 lines to the telephone central office. New positions will be added as the organization grows; it is expected that eventually a total of 1500 telephones will be required.

Independent for Automatic Service in Ecuador

Public sentiment as reflected by newspapers in Ecuador is favorable to the recent proposal of the Minister of Public Works that an Independent company be organized to develop automatic telephone service in the cities of Quito, Guayaquil, Cuence, Rioamba and Ambato. The plan would have the national government participate in the financial organization of the company and newspaper reports indicate the Municipal Council of Quito would also assist in the financing.

At the same time, the Government is reported to have signed a contract with the Ericsson Company of Sweden, providing for an initial installation of 6,000 automatic telephones each for the cities of Quito and Guayaquil, with five-digit equipment possible of ultimate expansion to 90,000 lines.

Propose Rate Increase

The Van Hook (N.D.) Farmers Telephone Company's request for authority to increase its rates is under consideration by its state public service commission. The following schedule is asked by the company:

Town business phones $2.50 per phone, per month.

Town residence phones $1.50 per phone, per month

Rural phones $1.50 per phone, per month

Kansas Meeting a Success

Kansas telephone men held their annual session on March 14 at Topeka. H. B. Couch reports that it was good to meet again after a two-year recess.

The meeting was opened with a welcome by Albert L. Orr, member of the Corporation Commission. He expressed a clear understanding of the telephone problems of today and said the commission stood ready to help solve them.

Directors elected were: C. J. York, Girard; W. H. Reilly, Topeka; Tom Fegan, Junction City; M. R. Campbell, Wellsville; Foster Laming, Tonganoxie; F. M. Browne, Kansas City; W. C. Wilkin Nortonville; Walter Pedigo, Pratt and Carl L. Spaid, Kansas City.

All the officers were re-elected as follows: Samuel Tucker, Pleasanton, president; Walter Pedigo, Pratt, vice president; Estella Henderson, Pleasanton, treasurer and H. B. Couch, Topeka, secretary.

The Round Table plan of discussion prevailed throughout the day under the able leadership of Samuel Tucker. The subjects were of current interest.

Rural Electrification vs. Telephone was covered by Geo. L. Hawley, Engineer, Southwestern Bell Telephone Company. He outlined how to cooperate in the construction of power lines so as to cause the least difficulty with telephone service.

H. S. Hinrichs, Engineer, Kansas Power and Light Company explained how telephone service can ride over power lines to reach remote places not now receiving telephone service. Mr. Hinrichs expects to install an experimental line soon.

Frank C. Arthur, chief engineer Kansas Corporation Commission, pointed out the necessity of better annual reports, especially from the smaller telephone companies as the information contained in the reports from year to year is important in determining the need of rate adjustments.

The Telephone Advertising Institute was represented by Leon F. Roberts, chairman of the organization. Carl L. Spaid and Samuel Tucker joined in promoting the advertising program.

Col. Carl A. Kraege concluded the program with a very interesting description of communication service and rates in Europe.

To Install Dial

The North Carolina Utilities Commission granted authority to the Oldtown (N. C.) Telephone Company on March 18, to install dial exchanges at Lewisville, King and Stanleyville, North Carolina.

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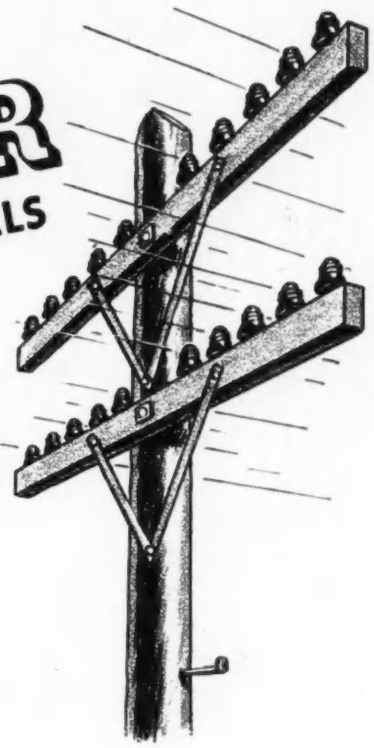

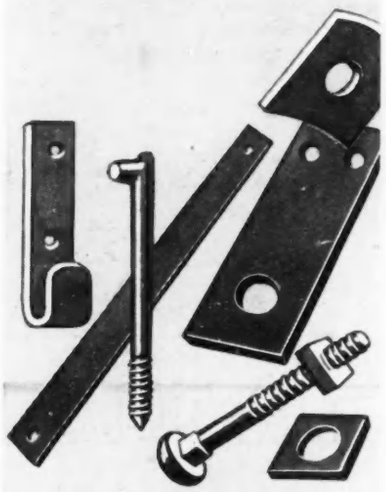

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—and other Hardware for Telephone Line Construction

Telephone men want hardware they can depend on . . . hardware that cuts down on replacement costs . . . saves on labor and labor costs . . . stresses quality and staying power.

No wonder so many linemen are "lining up" with Oliver products in the construction of new lines or for the replacement of old line hardware. Oliver quality goes all the way to keep service uninterrupted.

For staying power that pays, "Line Up" with Oliver hardware now.

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NOISE AND CROSSTALK ? ?

Bring Levels Down

AN important item on the spring and summer construction program should be the reduction of noise and crosstalk on rural and toll circuits. Both noise and crosstalk levels are inclined to show an increase with time. The change is usually gradual and often is not noticed by subscribers or operators in the normal use of the line. However, it does tend to impair transmission and to a certain extent to discourage the use of long distance service. This gradual increase in noise and crosstalk with age, which some open wire circuits seem to undergo, is due largely to the resistance unbalances which creep into telephone circuits to the greater length of parallels and the higher loads carried by power lines.

Principal Causes of Crosstalk and Noise

The increased crosstalk and noise levels can generally be attributed to one or more of the following specific causes (Fig. 1).

(1)—leakage to ground
(2)—unbalanced series resistance
(3)—telephone circuits inadequately transposed
(4)—power lines which have abnormally high inductive influence.

One of the most common causes of noise and crosstalk on rural lines is *leakage to ground.* This is particularly true from a power noise standpoint. Rural power lines of the type now commonly used, have exceptionally high inductive influence. These power lines induce relatively large voltages (50-100 volts not unusual between telephone wires and ground. If the telephone lines are properly transposed, these voltages are kept *balanced* on the two wires and the noise is reduced to a minimum. If, the telephone lines become unbalanced, due to a leakage path to earth, the balanced noise voltages are then able to set up circulating currents which appear in the connected subscriber's sets as noise.

Because of the magnitude of the voltages induced between telephone wires and ground, even relatively high resistance leakage paths such as tree limbs, slightly dirty arrestor blocks at subscriber's station or at the central office may be a substantial source of noise. Some telephone lines will be relatively quiet during dry weather but become very noisy during wet weather. This condition shows up particularly with leaky cable, tree limbs against line wires, wires off insulators, etc.

All line wires should be properly attached to the insulators. Wiring at terminals should be checked to insure that leakage paths do not exist due to faulty insulation. Old-fashioned arrestor blocks should be replaced as they are prone to carbonize after every lightning storm, whereas modern arrestor blocks do not. These are but a few of the operations which will result in a high value of insulation resistance and a low value of noise and crosstalk.

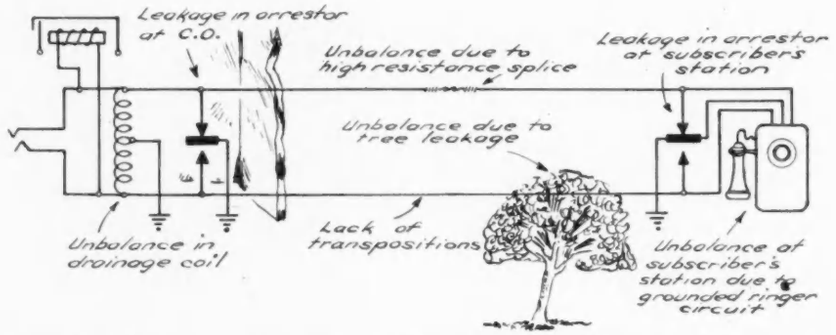

Leakage in arrestor at C.O.
Unbalance due to high resistance splice
Leakage in arrestor at subscribers station
Unbalance due to tree leakage
Unbalance in drainage coil
Lack of transpositions
Unbalance at subscriber's station due to grounded ringer circuit

Figure 1—Typical sources of inductive interference and crosstalk on rural and toll lines.

In reducing the overall noise and crosstalk in an exchange, the first effort should be towards eliminating leakage paths to ground. Trees should be trimmed so that they do not touch the wires.

Series Resistance Unbalance

Low values of noise and crosstalk require that the *electrical symmetry* or balance of a telephone circuit be as near perfect as posisble. It is essential that

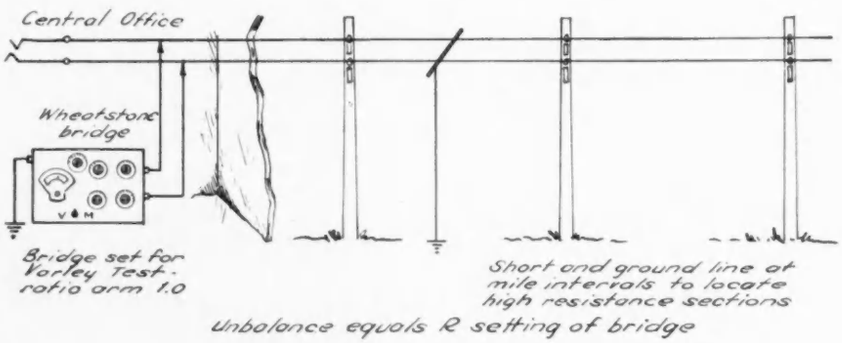

Central Office
Wheatstone bridge
Bridge set for Varley Test - ratio arm 1.0
Short and ground line at mile intervals to locate high resistance sections
Unbalance equals R setting of bridge

Figure 2—Use of Wheatstone bridge simple Varley test to measure wire unbalance.

EVEREADY
COLUMBIA
GRAY LABEL
LONG LIFE
TELEPHONE CELL
This dry cell is the original telephone cell greatly improved and is built especially for telephone use. It delivers long service life with uniformity and dependability in the highest degree.
A
NATIONAL CARBON COMPANY
PRODUCT
MADE IN U.S.A.

YOU'LL NEED *Fewer* REPLACEMENTS

if you use these batteries!

•

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide and Carbon Corporation

UCC

General Offices: **30 East 42nd Street, New York 17, N. Y.**

Division Sales Offices: **Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco**

The trade-marks "Eveready," "Columbia," and "Gray Label" distinguish products of National Carbon Company, Inc.

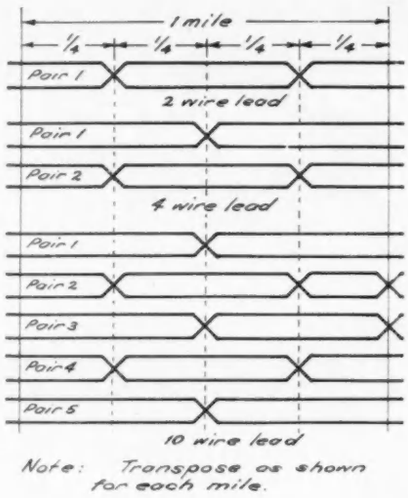


Figure 3—Transposition plans suitable for rural and minor pole lines.

the series impedance of the two sides of a telephone circuit be equal and balanced along the length of the circuit itself. This is particularly important in dealing with circuits, which for one reason or another, have a center-tapped ground connection. A common battery circuit for example has what might be termed a "balanced ground connection." This is necessary to feed battery out to the subscriber's telephone. Trunk circuits employing simplex dialing also utilize retard coils connected across the line with the midpoint grounded. Drainage coils used to relieve static charges, also constitute a balanced ground arrangement. It is these "balanced ground" circuits that show the greatest noise tendency under conditions of series resistance unbalance.

Principal Sources of Resistance Unbalance

The principal sources of resistance unbalance are: (1)—defective line wire joints, (2)—loose connections in the subscriber's drop or wiring, (3)—loose connections in terminals, at junction poles, etc. The obvious remedy is to use modern compression type sleeves at all line and drop splice points and good high quality test connectors (or special compression sleeves) at points at which the subscriber's drop or bridle wire is bridged to the line wire.

The simplest method of measuring the unbalanced resistance of open wire circuits is to use a Wheatstone bridge and the *grounded Varley test.* With this test, the bridge is usually connected at the office end of the line and a short and ground placed at successive points out on the lines as shown in Fig. 2. With the bridge ratio arm set on. 1.0, the rheostat setting (R) will indicate the difference in resistance of the two sides of the circuit. In making this test it is necessary that the line wire having the lowest resistance be connected to the X_2 terminal of the bridge, otherwise the bridge cannot be balanced. A direct reading ohmmeter can be used in conjunction with a third wire to obtain the individual wire resistance by the familiar *triangulation method.* This method is somewhat more troublesome than the bridge method and cannot be used in many cases as only two wires may be involved.

Lines Inadequately Transposed

Merely making a grounded line metallic will greatly reduce the amount of noise and crosstalk experienced. But this alone is not sufficient where good high quality circuits free of noise and crosstalk are the desired objective.

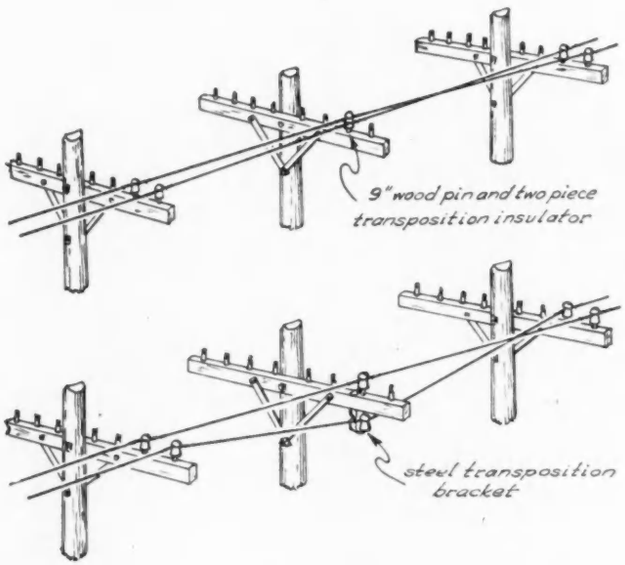


Figure 4—Method of making physical transpositions.

Transpositions in the telephone circuits are needed to bring noise and crosstalk down to minimum values. If properly placed they bring about an *equalization* of the voltages induced in the two sides of a telephone circuit. This equalization of the induced voltage, reduces the *net voltage* available to force crosstalk or noise currents through the connected telephones.

Transpositions may either be applied on a *standard scheme basis,* or on a *mile by mile basis.* A transposition scheme (or section) consists of a comprehensive arrangement of transpositions of all the wires likely to be carried on any open wire lead (40 wires). These sections are so designed that every circuit on the lead is balanced to every other circuit from a crosstalk standpoint and also to outside exposure from power lines.

Simple *mile-by-mile* transposition arrangements, which are satisfactory for the average rural line and for unimportant short haul toll circuits, require fewer transpositions per mile and are somewhat easier to apply. Fig. 3 shows several transposition arrangements suitable for minor toll and rural lines.

Special Sources of Unbalance

Power noise and crosstalk are occasionally due to unbalance in the central office or subscriber's station. Ringers of the low impedance type connected to ground are a typical source of unbalance. They should be either replaced with high impedance ringers or a gaseous type tube inserted in series with the ringers. If the induced power voltage is excessively high, gaseous tubes may remain in the ionized condition and not work properly.

Repeating or retard coils which are used for battery feed purposes or for simplex dialing, may be a source of unbalance if the windings are not identical, or if a portion of the winding has been shorted out by lightning. Whether or not such items are contributing to the noise on the line, can be determined by

(Please turn to page 98)

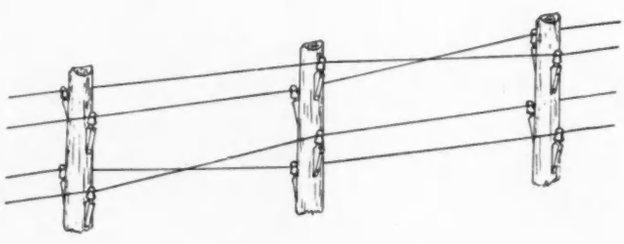
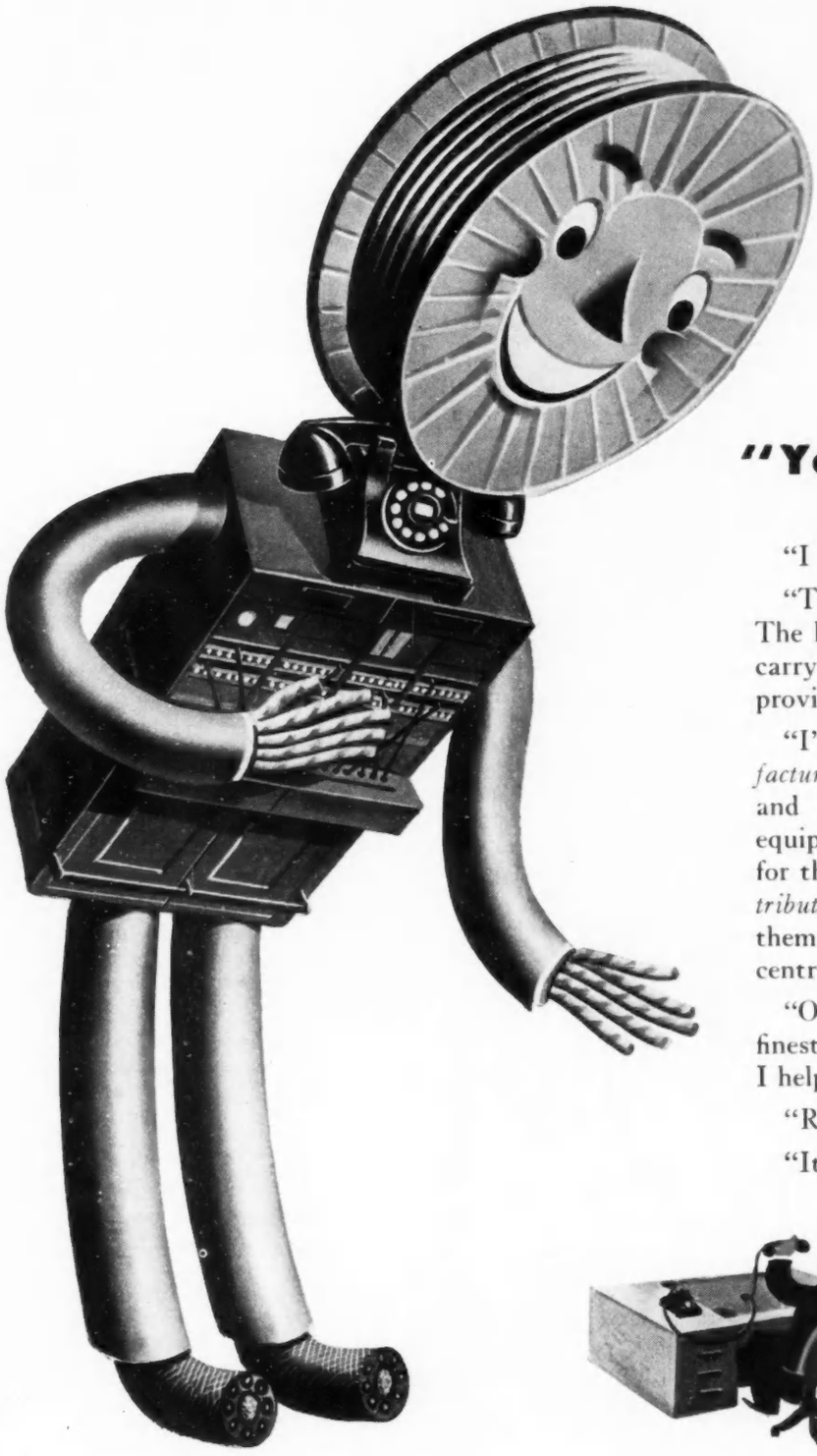


Figure 5—Method of making transpositions on bracket lines.



"You rang for me?"

"I have been working for you for years.

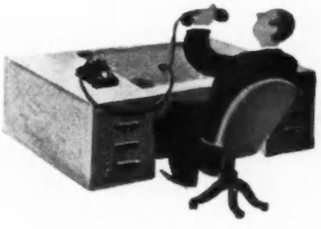
"That telephone in your hand, I made. The long thin wires, the stout cables that carry your voice at the speed of light . . . I provided them, too.

"I've been busy . . . since 1882 . . . *manufacturing* telephones, switchboards, cable and other Bell System apparatus and equipment. I *purchase* supplies of all kinds for the Bell Telephone companies . . . *distribute* all this material and equipment to them throughout the nation. I *install* central office switchboards.

"Our nation's telephone service is the finest and most economical in all the world. I help make it possible.

"Remember my name . . .

"It's Western Electric."



MANUFACTURER... of 43,000 varieties of telephone apparatus.

PURCHASER... of supplies of all kinds for telephone companies.

DISTRIBUTOR... of telephone apparatus and supplies.

INSTALLER... of telephone central office equipment.

FOR THE BELL SYSTEM

Western Electric

IMPROVING SERVICE

on Switching Lines

IN many rural communities the farmers own and operate their own telephone lines. These farmer owned lines connect to nearby telephone exchanges which provide a central switching service. Lines of this type are commonly known as *switching or service lines.*

The usual business arrangement between the telephone company and the service line company is for the former to provide the switching service at a nominal monthly charge for each switching subscriber served. In most cases service line companies maintain their own lines but in some instances the telephone company maintains the lines and bills for labor and material expended.

Service lines were originally established by farmers in sparsely settled localities desiring telephones before telephone companies had extended their lines into the rural areas. Many of these pioneer service lines have been sold to the local telephone company by the former owners who no longer wished to bother with the problems incident to operating their own telephone lines.

However, there are still thousands of farmer service lines in use.

Good Service Needed

A telephone is indispensable to the farm family. It is not only a great convenience which materially aids in the efficient operation of a farm but it offers genuine security and protection when some unforeseen emergency arises.

If a record were available to show all the lives that have been saved by the prompt arrival of a doctor summoned to a farm by telephone, all would agree that a telephone on the farm is not a luxury but a necessity.

Because of the invaluable assistance rendered by a telephone during an emergency as well as its constant utility in the every day routine of the average farmer, it is essential that rural telephone lines be properly built and maintained, otherwise they may fail at the very time when they are vitally needed.

Many service lines were built 25 to 40 years ago. Some of these lines still use a large part of the original poles, wire and telephones.

Due to the inevitable depreciation that has taken place without commensurate repairs, the service rendered on many farmer *service lines* has become poor and unreliable. This has shown up in a variety of ways, such as: the difficulty of being heard, unreliable signalling, instrument burnouts during storms, lines out of service for abnormally long periods, fires started in farm dwellings due to inadequate protectors, etc. This is, of course, not true of all service lines as many are efficiently maintained and splendid service is furnished.

The question is frequently asked, *How can the service on badly run down service lines be restored to normal?*

The shortest answer we can give is, revive interest in your connected service lines. Encourage the line owners to find out what work is needed to put the line and telephones in good working order—urge them to set up rebuilding programs.

If their service line organization is run down get them together and encourage them to select new officers, delegate responsibilities and make plans for raising the funds necessary to put their lines up in good shape. If time permits, help them to make a survey of their needs.

If they do not have funds sufficient to hire trained men to rebuild their lines, suggest that they organize a series of "construction picnics" at which all the line subscribers get out and help restore the lines to good working order. Impress on them that they should use good materials and construction methods. Theoretically, service lines are not your responsibility but they may reflect against you and the industry as a whole if they render poor and inadequate service. It would seem to be *good business* for telephone managers to take a more active interest in their connected *service lines.*

LINEMAN CUTOUTS . . .

TO the uninitiated the expression *lineman cutouts,* might mean the rupturing of an electrical line switch or fuse, but to the man on the pole it means an abrupt and an unanticipated descent toward the ground. Cutouts result when a lineman's spurs fail to penetrate or when they break out of the wood. A recent survey in the power field shows that cutouts may be due to any one of a number of different causes, some of which are:

1. Knots
2. Knotholes
3. Broken poles
4. Weather cracks
5. Freshly creosoted poles
6. Excessive gaff cuts
7. Splinters
8. Poles coated with ice
9. Rotten poles (outer layer)
10. Poles hardened by various preservative treatments
11. Crooked or leaning poles
12. Bird holes
13. Improperly guyed
14. Scaly poles
15. Poles splintered by lightning
16. Old gains and drillings
17. Flat surfaces on poles
18. Small and limber poles
19. Poles set too shallow in ground
20. Poles not properly tamped
21. Cemented bird holes
22. Hollow poles
23. Splits in poles
24. Frozen blackjacks (creosoted pine poles)

Two remedies to help minimize cutouts are suggested: (1) remove the causes so far as possible, and (2) train linemen to be on the alert for conditions which might otherwise cause their spurs to cutout with consequent danger of injury.

New Rates

The Tabor Telephone Company, Angus, Minn., is increasing its rates on the first billing date following April 30 from $10 to $15 annually. The Minnesota Railroad & Warehouse Commission authorized the increase on March 27.

United Utilities Hold Annual Meeting

At the March meeting of the directors of United Utilities, Inc., Abilene, Kansas, the following officers were elected:

Henry J. Allen, chairman of the board; Alden L. Hart, president; C. A. Scupin, 1st vice pres.; Ralph W. Dockstader, vice pres.; Gustav Hirsch, vice pres.; A. Z. Patterson, vice pres. and counsel; C. A. Scupin, treasurer; O. D. Small, secretary; H. L. Hunting, asst. secy. and treas.; E. E. Anderson, general auditor; and B. I. Litowich counsel.

Directors elected by the stockholders at the annual meeting of United Utilities are: Henry J. Allen, Harry Darby, Ralph W. Dockstader, Alden L. Hart, Gustav Hirsch, R. C. Kemper, and A. Z. Patterson.

Salary Increase Pattern

P. H. Needham, assistant head of the Salary Stabilization Unit of the Treasury Department, stated to *Telecommunications* March 22 that in an industry where a wage pattern had been established salary increases could be granted managerial and supervisory employees in salary brackets up to $7,500 without prior approval of the Wage Stabilization Board or the Salary Stabilization Unit. The increases would follow the industry's wage pattern increase, with the same hourly wage boosts being granted management and supervisory employees in the $7,500 and below salary brackets. Increases, however, would be contingent on publication by the Wage Stabilization Board of a general order covering an industry as having established a wage increase pattern.

For top executive salary increases, above $7,500, increases would have to be considered by the Salary Stabilization Unit on the basis of applications filed by individual companies.

Mr. Needham pointed out that the latter increases would be given scrutiny from the viewpoint of "equities" on earnings' differentials within the industry. "In the near future," Mr. Needham said, "a list of master regulations on salary increases would be issued covering industry-wide wage patterns."

STROMBERG-CARLSON
RECOMMENDS—

COOK TYPE "O"

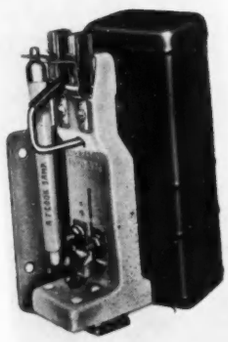
Sub-Station Protectors

★

Built to "TAKE IT"

★

Single Circuit Protectors for Indoor and Outdoor Use



The Type "O" single circuit protector with one pair of fuses and one pair of high potential dischargers is unexcelled for both indoor and outdoor use.

The sturdy body of the Type "O" is a single piece of heavy white glazed, low absorbent porcelain, designed to prevent surface leakage. Phosphor bronze fuse and lightning arrester clips are securely fastened to the body by Everdur bolts.

The Type "O" Sub-Station Protector is made for various types and lengths of fuses. Fuses are 5 amperes and blow at rating. When specified, either higher or lower rating will be furnished.

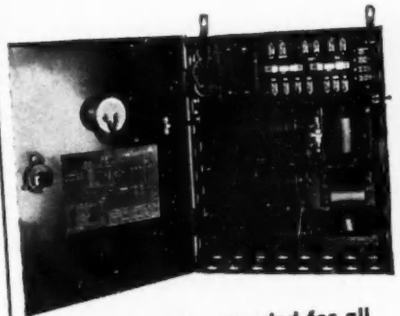
Type "O" Protectors have a round hole in the porcelain base for small size lead-covered, rubber-insulated cable for underground distribution, or where circuits pass under railroads, roadways, etc.

COOK ENGINEERING GUARANTEES TOP PERFORMANCE

ELECTROX CONSTANT VOLTAGE BATTERY ELIMINATOR

TYPE RA

Manufactured by Schauer Machine Co.



Especially recommended for all Lamp Signal and Automatic Switchboards.

Completely Automatic
Requires No Manual Adjustments

Delivers smooth, humless, constant output voltage irrespective of current drain, up to the maximum output of the rectifier. Standard rectifier capacities of 1 to 4 amps., from 12 to 48 volts.

- LOW FIRST COST
- LOW OPERATING COST
- DEPENDABLE SERVICE
- LONG LIFE

Write for Circular 443

STROMBERG PROGRESS IN TELEPHONY CARLSON

STROMBERG-CARLSON COMPANY

Factory and General Offices: Rochester 3, New York, U. S. A.
Branch Offices: Chicago, Kansas City, San Francisco, Toronto

STROMBERG-CARLSON
Recommends...

HIGHER SUSTAINED VOLTAGE

LONGER LIFE

ROCK-BOTTOM ECONOMY

These qualities—more important now than ever before—are assured through the constant supervision of America's largest dry battery laboratory.

Made by the makers of "Eveready" "Air Cell" Operators' Transmitter Batteries.

Nicopress

REDUCING SLEEVES

Unsurpassed for splicing two wires of different sizes . . .

MFD. BY
THE NATIONAL TELEPHONE SUPPLY COMPANY

★

Splices are so tight the conductors can not pull out.

★

STROMBERG-CARLSON COMPANY
PROGRESS IN TELEPHONY

Factory and General Offices: Rochester 3, New York, U.S.A.
Branch Offices: Chicago, Kansas City, San Francisco, Toronto

1945 Report is Good News at Stromberg-Carlson

In its annual report for 1945, signed by Dr. Ray H. Manson president, and Edwin C. Roworth corporate secretary, the Stromberg-Carlson Company announce a net profit, after tax provisions and transferring reconversion expenses to reserves, of $708,926.

The report shows that shipments during 1945 reached the third highest point in the company's history, being topped only by the billings of the war years 1943 and 1944. Upon consolidated billings for 1945 of $33,-144,603 (which included some $7,000,-000 in termination claims), and upon the company broadcasting operations, a total profit of $2,566,533 before income taxes was earned. Income taxes and excess profit provisions amounted to $1,877,500 while the previously established reserve for postwar rehabilitation was drawn on to the extent of $29,929.

Dr. Ray H. Manson
Stromberg-Carlson's President

In addition to the regular quarterly dividends on preferred stock, there was declared a dividend of $.75 on common stock, equal to that paid in 1944. Also $168,721, equal to 20% of the 1944 earnings, was used to retire 1,654 shares of preferred stock, leaving 3,124 shares outstanding at December 31, 1945.

The report indicates that manufacture of telephones and switchboards for civilian usage was resumed quickly after V-J Day but that reconversion for the production of radio receiving sets has taken somewhat longer to complete. Nonetheless, a chart forming part of the report indicates that, in addition to its heavy production of material for the armed forces, the company produced for civilian usage

in 1945 an amount of merchandise almost equal to that produced for civilian purposes in the prewar year of 1940.

The report refers to two new buildings now being constructed and states that the new cabinet shop now nearing completion adjacent to the company's main plant will be particularly helpful this year in the manufacture of the company's radio and television receivers, when the radio industry is finding it difficult to obtain sufficient cabinets.

The company reports that it is entering the postwar period in an excellent position having the products, manufacturing facilities, production know-how, selling and distribution coverage, a big potential market and wide consumer acceptance for its entire line of products.

Authorize Sale

The Roosevelt Rural Telephone Company, county of Mille Lacs, Minnesota, received authority from its state Railroad and Warehouse Commission on March 22, to sell to Chase Brook Rural Telephone Company, operating a system in the same county. The Roosevelt property was given the Chase Brook name.

U. S. Rubber Perfects New Wire

Geologists searching for new deposits of oil will have lighter equipment to carry into remote places as the result of the development of a new geophysical wire announced by United States Rubber Company.

Utilizing experience gained during the war, scientists of the company have perfected a wire which weighs much less yet has greater strength and flexibility than the prewar wire used on seismographic equipment in oil explorations.

Since equipment is often moved over rough terrain and, in some instances must be carried by hand, the saving in weight is an important factor.

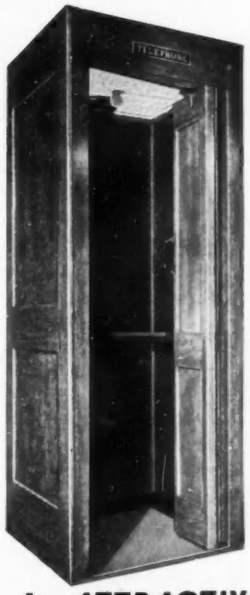
The new wire is made with a small diameter conductor insulated by the company's unique dipping process. During the war this process was used in producing lightweight Army telephone wire which could be carried more easily by troops engaged in establishing communications at the front.

Discontinue Operations

The Cogan House (Pa.) Telephone Company are discontinuing their Cogan House central office and have petitioned the Lycoming Telephone Company to provide switching service for the 40 subscribers involved from the latter's Trout Run exchange.

STROMBERG-CARLSON RECOMMENDS...

The **CHURCHILL**



***An ATTRACTIVE* TELEPHONE BOOTH**

Not only attractive — but comfortable and private—the **CHURCHILL** No. 100 Folding Door Telephone Booth will increase your pay station business.

Operating companies have found the **CHURCHILL** No. 100 Folding Door Telephone Booth a builder of pay station business.

It is constructed as a single unit and equipped with a reinforced back panel for mounting a wall telephone or coin collector.

The **CHURCHILL** Booth is made of selected white oak and is available in light or medium oak in a satin finish.

Included as standard equipment are electric light and automatic electric ventilator.

Overall height is 84¾"; width, 29"; depth, 30½". Shipped knocked down and crated.

Illustrated literature available.

IMPORTANT POINTS

. . . in Static Discharge

P-495 DISCHARGE BLOCK

Mfd. by RELIABLE ELECTRIC COMPANY

These important points provide the essential difference between the Reliable P495 Self-cleaning Discharge Blocks and ordinary discharge blocks. These points give you the extreme sensitivity of carbon to carbon gaps and yet have none of the faults inherent in this or other types of blocks.

The P495 Discharge Blocks are self-cleaning—eliminating dirty carbon trouble, reducing service interruptions, and providing lower maintenance costs.

"Reliable Identifies the Quality"

STROMBERG-CARLSON COMPANY

Factory and General Offices: Rochester 3, New York, U.S.A.
Branch Offices: Chicago, Kansas City, San Francisco, Toronto

Personalities

Robert Latvala, Jack Packa, Jack Anselmo, Matt Liesmaki, Arnie Koski, Emile Sande and **Roy Johnson** were the volunteers from the Cherry (Minn.) Telephone Company who loaded and hauled 580 needed telephone poles from Bear River, Minn. to Cherry.

●

Mrs. Frank Finley, telephone operator for the Linden (Wis.) Telephone Company for a number of years, is now the new owner of the system.

●

Mrs. Hattie Engquist, treasurer of the Harcourt (Iowa) Mutual Telephone Company, is enjoying a new office since the company moved from the home of **Ada Wassgren,** its location for the past fifty years, into a new building.

●

Harry R. Floyd is the new owner of the J. M. Smock Telephone Company, Holland, Oregon.

●

C. R. Sikes, owner of the Sikes Telephone Company, Glennville, Ga., increased rates April 1 from $2.75 to $3.25 on individual business lines.

●

W. E. Golehon is the new manager for Northwestern Bell Telephone Company at its Lexington, Nebraska exchange. **Jean Zeplin,** the former manager, was killed in an auto accident.

R. A. Phillips, vice pres. and general mgr. of Central Telephone Company, Sioux Falls, S. D., reports that **Paul M. (Sy) Schuchart,** who has been serving as a telephone traffic expert with the Signal Corps, is now their new traffic manager. Mr. Schuchart's former civilian connection was Chesapeake & Potomac Tel. Co. of Baltimore and prior to that Bell of Pennsylvania.

●

Homer E. Smart, district commercial manager, Ohio Bell, reports that mobile radiotelephone service furnished by their company will be ready for tests by July or August. The FCC has granted authority for construction of the radio station for radiotelephone service.

●

A. N. Seward, gen. mgr., Southeastern Telephone Company, reports that construction of a new building at Fitzgerald, Ga., will go forward as soon as materials can be obtained.

●

Carl Dieckmann, 62, Champaign (Ill.) manager of Illinois Bell Telephone Company since 1928, died March 4 after a heart ailment for over a year.

E. J. Hardgrave (center), asst. gen. mgr., retiring after 35 years with the San Angelo (Texas) Telephone Co., receives a diamond studded pin from the employees of the company. E. L. Jones (left), general auditor, is making the presentation and J. Y. Rust (right), president, looks on.

Ray L. Atkinson, chairman of the Forestry - Conservation Communications Association, Region 2, Southern States, reports a three-day meeting at the Whitley Hotel, Montgomery, Alabama, April 17, 18 and 19. Telephone and radio manufacturers were invited to display products during the meeting.

●

Ben Hall, owner of the Avon (S.D.) Telephone Company, now also owns the Emery (S.D.) exchange, which is being operated under the name of Tri-County Telephone Co. **Kenneth B. Ray,** a veteran who served 42 months in the South Pacific, is leaving the Avon exchange to be Emery's local manager.

●

A. J. Allen, president of the Cincinnati (Ohio) & Suburban Bell Telephone Company, is retiring May 1 after 39 years service with the Bell system. Promotions effective May 1 due to Mr. Allen's retirement: **B. L. Kilgour, Jr.,** from vice president to president; **R. A. Weaver,** from general plant mgr. to vice president; and **Harvey P. Johnston,** from plant superintendent to general plant manager.

●

W. H. Daubendiek, secretary of the West Iowa Telephone Company, reports that their 20 year franchise in Anita, Iowa has just been renewed. At the city election there were only four dissenting votes, which speaks favorably for the West Iowa Telephone Co.'s past service.

●

A. W. Conrad is back in the Chicago office of the Copperweld Steel Company's Glassport, Pa., Div. after several years in the armed forces.

●

A. O. Talmage, new president of the recently incorporated ($200,000) Laco Telephone Company, Ronan, Montana, plans to install 2,000 telephones in farm homes of the Flathead valley. **A. E. Willmert** is vice president and **Frank Tryon** is secretary-treasurer. Mr. Talmage reports that the Laco company's farm telephone plan has REA backing.

Commissioner **Fletcher Plumley** (Vermont) and **Kyle B. Williams** (Missouri) have been appointed to the NARUC Committee of "Five" to cooperate with the FCC in telephone regulation. The other three members are Commissioners **H. Lester Hooker** (Va.), **B. Frank Morgal** (Pa.) and **Ray O. Weems** (Okla.).

•

E. Lockhart is the new supt. of Telegraph and Signals with headquarters at Princeton, W. Va. for the Virginian Railway Company and succeeds **A. R. Kyle,** who is retiring.

•

Charles E. Clift, lately discharged from the Army Ground Forces where he served with the Field Artillery in combat and later with the Counter-Intelligence Corps as an agent in regimental, divisional and corps assignments, has been appointed assistant to FCC Commissioner, **Clifford J. Durr.**

•

R. S. Griffin, secretary of the Georgia Telephone Association, resigned April 1. **J. E. Kirk,** president of the association, has asked **Arlie New,** one of the directors, to act as secretary until a permanent secretary can be elected. All correspondence should be addressed to Mr. New at Thomaston, Georgia.

•

Don B. Hill, manager of the Virden (Ill.) exchange of Illinois Central Telephone Co., Clinton, has been chosen president of Virden's Chamber of Commerce.

•

Clyde McFarlin, president of the Montezuma (Iowa) Mutual Telephone Company, has been working for over a year to get all the equipment together for installing their new switchboard.

•

Harry J. Rowe, president of the Stayton (Ore.) Mutual Telephone Co., reports a new switchboard is to be installed soon and 12,000 feet of cable are on order to replace some of their present open wiring.

•

Leo B. Bozell, 59, of Bozell & Jacobs, public relations and advertising agency, who worked on the early formation of the Telephone Advertising Institute, died in Omaha, Nebraska on March 31. Mr. Bozell was the brother of **H. V. Bozell,** president of the General Telephone Corporation, N. Y., N. Y., and was one of the nation's leading utility advertising men.

•

P. L. Perkins, manager and secretary of the Postville (Iowa) Farmers Telephone Company has resigned after 30 years of telephone service.

STROMBERG-CARLSON
Recommends...

POLES
Bearing this Trade-Mark

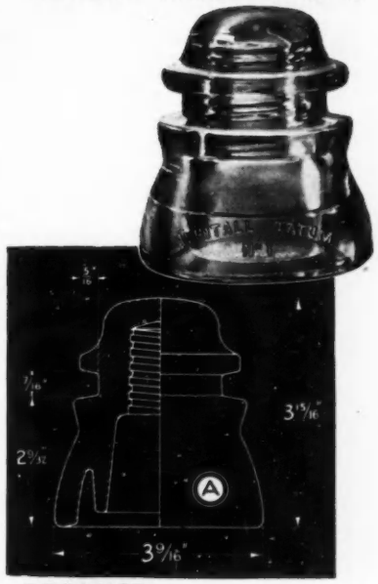
MTC

"The Stamp of Character"
Product of
T. J. MOSS TIE COMPANY

Poles bearing this trade-mark are your guarantee of the highest quality creosoted southern yellow pine poles.

Every pole bearing this mark is completely supervised from tree to consumer by men experienced in the industry.

ARMSTRONG'S
"WHITALL TATUM"
GLASS INSULATORS



BECAUSE:

1. Batch materials undergo rigid chemical laboratory inspection.
2. They are precision-made entirely by automatic machinery, eliminating human errors.
3. Quality of glass is assured through microscopic examination.
4. They are polariscope-checked against presence of dangerous strains.

Characteristics of "Whitall Tatum" Glass Insulators:

- Accurate dimensions
- True pin fit
- Crystal clarity
- Withstand severe temperature changes

They conform to — or exceed — A.S.T.M. standards.

STROMBERG-CARLSON COMPANY
STROMBERG PROGRESS IN TELEPHONY CARLSON

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Branch Offices: Chicago, Kansas City, San Francisco, Toronto

Conducted by the
Observer and his Gang

THE Observation Tower

If you have observations or even a friendly bit of argument suitable for use in this column, you are invited to send them along, which automatically makes you a member of the Gang. You will be anonymous—no names of telephone people or telephone companies are used in this column. Address "The Observer," in care of TELEPHONE ENGINEER AND MANAGEMENT.

Farm Telephones Again

GANG Member No. 12, who is a thoughtful sort of cuss, says this farm telephone proposition has him puzzled. He thinks there are a lot of things about it that somebody should straighten out.

He says, for instance: Our Big Brother in the telephone industry says he is going to install a million new farm telephones in the next few years, and that the job will take about 100 million dollars. Now, Independent companies serve at present in more farm territory than Big Brother does. If he installs a million new farm telephones, won't the Independents have to go and do likewise, or more than likewise, in order to hold up their end of the farm telephone development?

And, if they do go and do likewise, or thereabouts, where are they going to get the money to do it with? Especially, where are the small Independent companies going to get the money? They, incidentally, serve a majority of the farm telephones that are now served in the Independent field.

If Big Brother is going to spend 100 million dollars so that a million more farmers can have telephones, won't the Independents have to spend more than that? And, if they're not prepared to spend that amount of money, or don't want to do it, then won't Big Brother have to start serving farmers in territories that Independents now serve?

Also, it has been said that about 80% of the farmers who do not now have telephones can be reached from present construction, without any or much extension of present lines. But if, under those circumstances, it still costs an average of $100 per station to install new farm telephones, how is any telephone company going to make any profit on farm telephones unless farm telephone rates go up a lot?

Further, just how important in this picture are these newfangled things such as carrier current, radio, carrier on power lines, etc.? And what do they cost per farm telephone, not only to install, but also to operate?

We're not trying to answer these questions. We don't know the answer to them, and we doubt if anybody knows the answer to all of them. But we do know that when you're talking about 100 million dollars or more in the Independent telephone industry, you aren't talking about hay!

We sort of have the feeling that maybe somebody has got the cart before the horse on all this farm business, anyway. We think it might be a good idea to find out, before anybody goes off the deep end on this proposition, just how many farmers there are, now without telephones, who actually want or will take them at rates that will afford the telephone company a profit, if possible—or at least that will allow it to break even.

There are a large number of small Independent companies that cannot subsidize farm telephone service and still live. Their profits on their town telephone service are too small.

These are the same companies that will have the most difficulty obtaining the money with which to extend their farm service.

They are also the same companies that are going to be up against the buzz-saw when a big neighbor company starts whooping it up, in farm territory contiguous to the little company, for more and better telephones on farms. It will then be difficult for the big company to avoid spilling over into the little company's territory if the little company is not prepared to supply the service there itself, and that will be the case even when the large company doesn't want to do it. The only cure will be for the small company to be prepared to take care of its own territory in the same style that the large company is handling its own.

We think there is a good chance of this farm telephone proposition being a real headache to a lot of telephone people before we are through with it.

More About Taxes

A GANG Member calls our attention to the fact that the largest telephone system in the country paid in 1945, according to its annual report to stockholders, an average of $22.83 per share of its capital stock for taxes and that it earned $8.66 per share for its stockholders. In other words, says this Gangster, 72½% of the earnings went to various governmental agencies for taxes and only 27½% was left for the stockholders. Then when the stockholders got their dividends they again paid taxes on them.

This Gang Member says that he read somewhere that some noted economist of the past made the statement that no economic system can survive for very long when the government under which it exists has to have more than 25% of the profits of industry in order to keep itself going.

This Gangster admits that it costs a lot of money to fight a war and that all hands and the cook must divvy up to help pay the expenses but he says even 25% of the profits of a business is a pretty good slice to take out of it for the expense of government in time of peace.

We don't know what all of this leads to, nor, says this Gangster, does he. We just thought we would call it to your attention.

This'll Make Your Face Red

A GANG Member who refuses to even let us quote his number, and who freely admits to being a sourpuss, says that in his opinion business men in general—and that includes telephone business men—are the most inept, dumb, stupid and inefficient people imaginable when it comes to putting business before the public in a favorable light.

He says that in consequence, labor leaders, rabble rousers, do-gooders, politicians, spell-binders and a lot of other people who know how to publicize what they are doing and to get a favorable public reaction to it, run rings around business. One consequence to that, he thinks, is that a lot of people think that business men are just a bunch of greedy you-know-whats, willing to steal a penny off of a dead man's eye, and always out for themselves no matter what happens to anybody else.

He thinks all this could be easily cured if business men in general were not so darned inarticulate. They make speeches, he admits, but they make them to other business men, and when they write things they write them for other business men to read—and the public never listens to or reads that stuff.

The fact is, we think, that business men are just about the same kind of people as everybody else. They're not all pure, of course—but neither are the people who work for them. They're not all bad—but neither are the people who work for them.

They're not so awfully inarticulate, either, about things pertaining to their business, when talking to other business men. We've heard some pretty good speeches made at business conventions by business men. Of course, we've heard some pretty poor ones, too.

We think the real answer is that the average business man is too busy with his business to really learn how to, or to spend much time on, popularizing business. The difference between him and the rabble-rouser is that the latter hasn't got anything to do but rouse the rabble. The business man has to work.

Maybe business needs a press agent. We rather think it does. Somebody who can talk the kind of language most people understand. Business should be popular; not always on the defensive. After all, where would this country be without it? Where would be be if we all had to depend on the politicians for a living?

How Much is Depreciation?

GANG Member No. 232 tells us that he has the impression that the war situation and its consequences have had or will certainly have some sort of a repercussion on depreciation accruals and reserves of telephone companies.

Just what kind of repercusion this Gangster says he doesn't know but he points out that the increased cost of equipment and particularly of labor have an important bearing on the value of things in a telephone plant that are customarily wearing out and that, therefore, certainly the amount in dollars and cents that is accrued for depreciation must necessarily be larger in the future than it has been in the past.

He thinks that if a telephone company is looking upon its depreciation reserve as a reserve from which it can replace things now being discarded from the plant, then it will find that the amount of its reserve is not nearly as adequate now and for the future as it may have been in the past.

We think the answer is that the amount accrued from earnings for depreciation is supposed to be an amount sufficient to pay for the things in the plant upon which the depreciation was accrued and not the amount necessary to replace those things at a cost higher than the original item cost. In other words, if the thing put into the plant costs more than the thing it replaces then only a part of the cost of the new thing can come out of the depreciation reserve. The remainder must be paid for by new capital money going into the business.

To put it another way, if materials, equipment and labor go up in price the investment in telephone plants goes up too, with the consequence that the business gradually becomes, from an investment standpoint, on a higher level of value. It also becomes on a higher level of costs, of course, and that in turn necessitates a higher level of rates for service. Sort of like a small dog chasing its tail.

The Better, the Cheaper

GANGSTER No. 32 says he has figured it out that a job of maintenance that used to cost his company say $1.50, now costs $2.50 or even more, depending on the amount of labor that is involved. He thinks the only answer, if telephone rates are to be held down, is to use equipment, construction and materials that are so good they won't need as much maintenance in the future as in the past.

That seems to make pretty good sense. The way costs are going up these days, one trip a year to a subscriber's station for maintenance may take all the shine off the profits on that station for the year.

Telephone Engineer — *George Ludway*

"Got that? Here's another—Mary Jane, 6th St.—Phone J-6103."

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1-080-C	4-049-B
1-080-D	4-109-C
1-102-D	5-083-C
2-083-C	5-109-C
2-102-C	5-109-DBB
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Chapter 12
Section 2

Pulse Position Modulation Systems

By B. C. BURDEN
Technical Consultant
Lincoln, Nebraska

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Frame Width-Pulse Duration, etc.

The gaps between pulses and the pulse duration are so chosen that the *frame width*, that is, the complete scanning of all channels is approximately 125 microseconds in width. The relationship between *channel pulses*, the *frame width* and the *marker pulses* for the eight and the 24 channel systems is shown by Fig. 164.

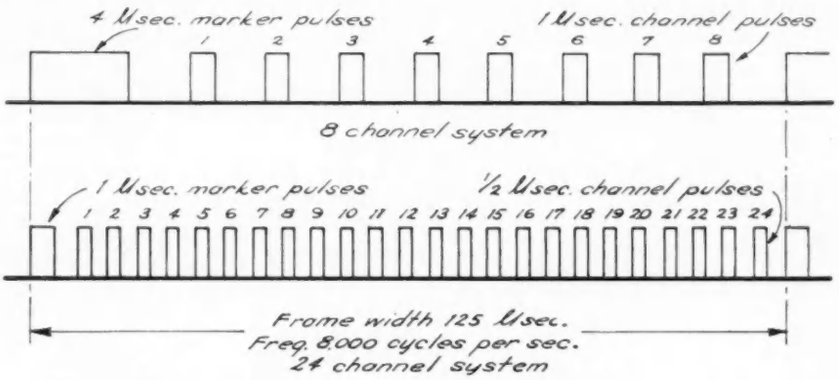
4 Usec. marker pulses
1 Usec. channel pulses
1 2 3 4 5 6 7 8
8 channel system
1 Usec. marker pulses
½ Usec. channel pulses
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Frame width 125 Usec.
Freq. 8,000 cycles per sec.
24 channel system

Fig. 164—Relationship between channel and marker pulses for one frame.

The number of channels that can be embraced in any PPM (or PTM) system depends on the number of pulses employed, the depth of modulation and the width of the pulses.

Details of the Eight Channel System

The details of the 8 channel PPM system (see Fig. 165) developed by the Bell System are of particular interest. This system utilizes multi-vibrator *electric gating circuits* for some of the functions accomplished by means of the commutator tube in the 24 channel system.

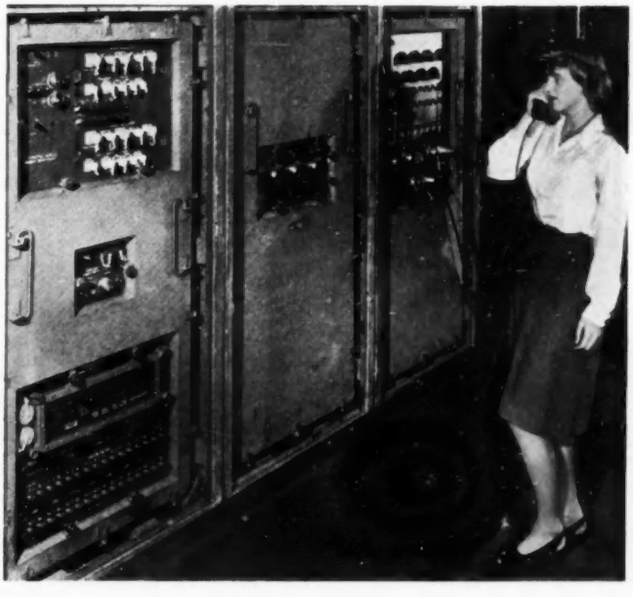

Fig. 165—Installation of eight channel AN/TRC-6 multiplex pulse position equipment in New York. (At the left foreground is the common frame, central foreground is the radio frame and right foreground is the multiplex frame.) Courtesy Bell Laboratories.

Operation of the 8 channel PPM system is as follows: (see Fig. 166)

An 8,000 cycle oscillator and clipper stage generates the basic marker pulse and serves to trigger off the pulse generator tube (in the position modulator) for each of the eight channels. The exact time that each pulse occurs is adjusted in each pulse generator so as to space the pulses evenly through the *frame*. Modulation of each individual channel pulse is accomplished in the *pulse position modulator*.

After the channel pulse is modulated it passes into a common circuit where it combines with other channel pulses and with the marker pulse. The *frame* of pulse and marker signals is fully assembled at this point, and after further amplification is impressed on a *modulator stage*.

The modulator stage is connected to the u.h.f. oscillator (frequency near 4300 mc). The u.h.f. oscillator is so biased that it oscillates *only* when the high energy channel and marker pulses from the modulator stage are impressed on it. The output of the oscillator therefore consists of spurts or pulses of ultra high frequency energy of the same duration and spacing as the applied marker and channel pulses.

Action at the Receiver

At the receiving terminal (see Fig. 167) the u.h.f. marker and channel pulses are combined with a locally generated u.h.f. to produce a beat frequency of approximately 60 megacycles. These lower frequency pulses are then detected thus essentially restoring them to their original simple form. After passing through limitor (clipper) stages which eliminate amplitude variations (see principle as used in FM), the pulses are impressed on a *marker selector*. This stage responds only to the marker pulses and not to the signal pulses. Although of

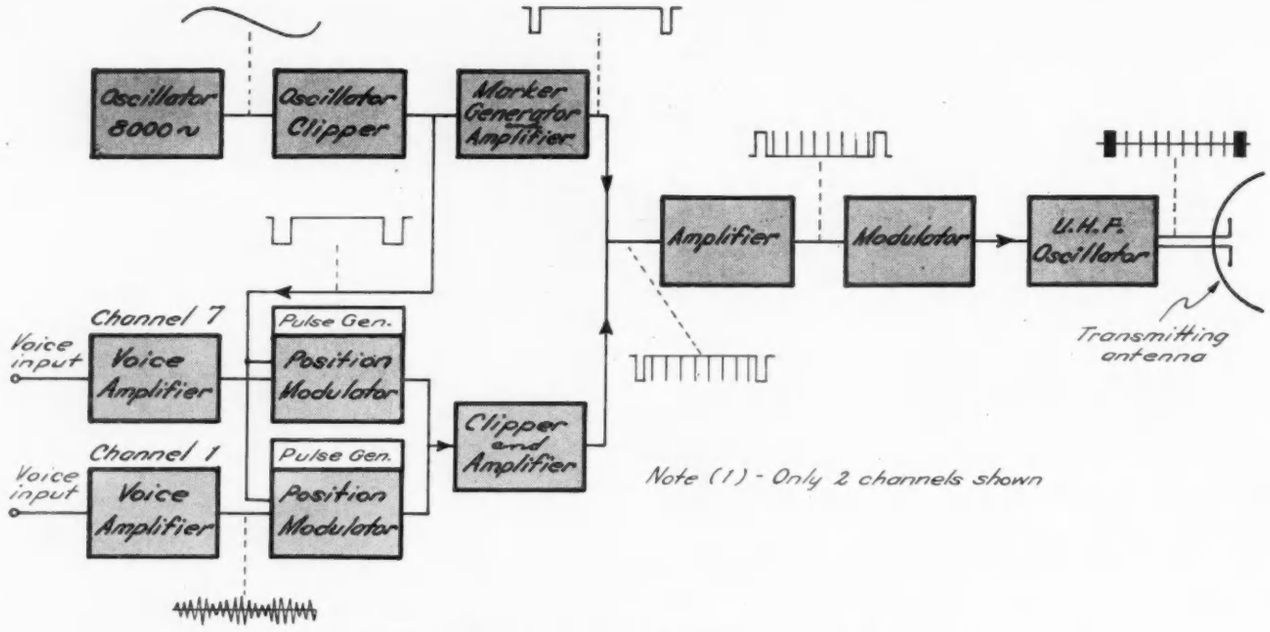

Fig. 166—Simplified block diagram of pulse position multiplex transmitter.

the same amplitude as the channel pulses, the marker pulses are four seconds wide and the channel pulses only one second wide and the selector operates on this difference in width.

The selected and amplified marker pulses are impressed on a *multi-vibrator* which locks into step with the distant transmitter thus providing the necessary synchronization between transmitter and receiver.

The multi-vibrator, under the excitation of the marker pulses, generates a square wave. These are passed into *eight gate generators* which produce *gate pulses* 13 seconds long (the full space allotted to each channel) and so spaced that each gate pulse falls in the exact center of the unmodulated position of its associated channel pulse.

The gate pulses and the channel pulses are jointly impressed (in proper time sequence) on a *pulse convertor stage*. This stage is so arranged that it converts the channel *pulse position* with respect to its normal unmodulated position into a *width variation*.

This *position-to-width* conversion, by its action on the plate current taken by the convertor tube, results in the development of a voltage replica of the original voice frequency.

The voice signal is then passed through a *low pass filter* which blocks the strong 8,000 cycle component and harmonics present. It then goes through a voice amplifier and into the wire line. Fig. 168 shows the relationship between the channel and gate pulses.

Basic Circuits of Eight Channel System

A somewhat simplified circuit of the eight channel multiplex pulse position transmitter will be illustrated in the next lesson. The timing unit of this system is the 8000 cycle oscillator which is coupled directly to an *oscillator clipper stage*. After passing through the clipper, the basic frequency is supplied to the *marker generator* and to the *pulse position modulators* for the several channels. The basic frequency thus establishes the *marker pulse* and initiates the respective *channel pulses*.

Time division of the channel pulses is accomplished by using a two-section (6SL7) triode operating as a multi-vibrator. The multi-vibrator is biased to

(Please turn to page 96)

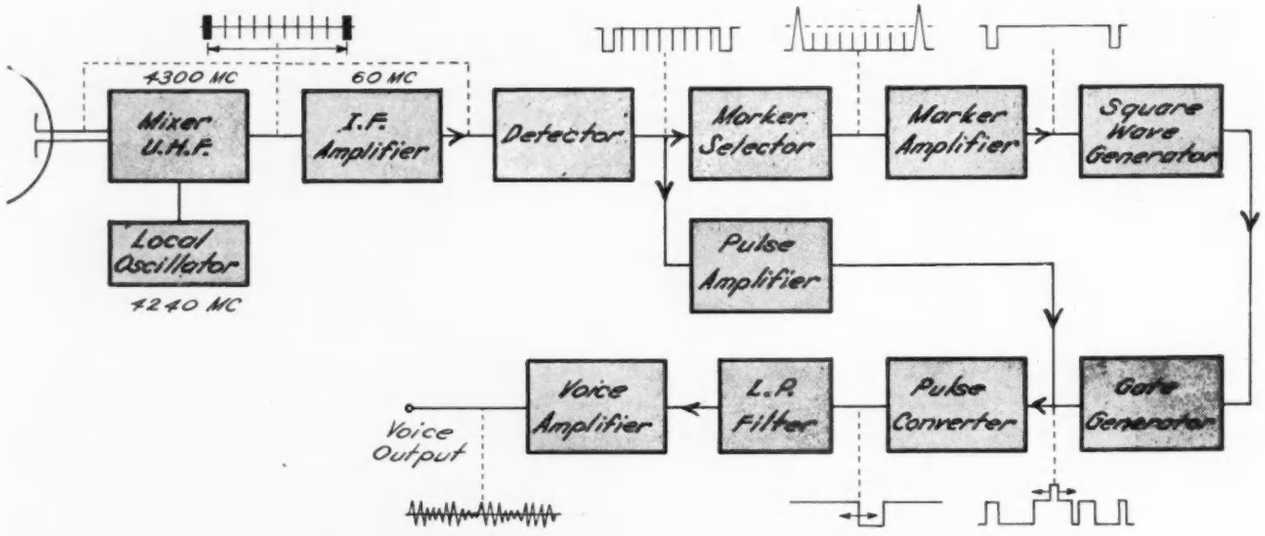

Fig. 167—Simplified block diagram of pulse position multiplex receiver.

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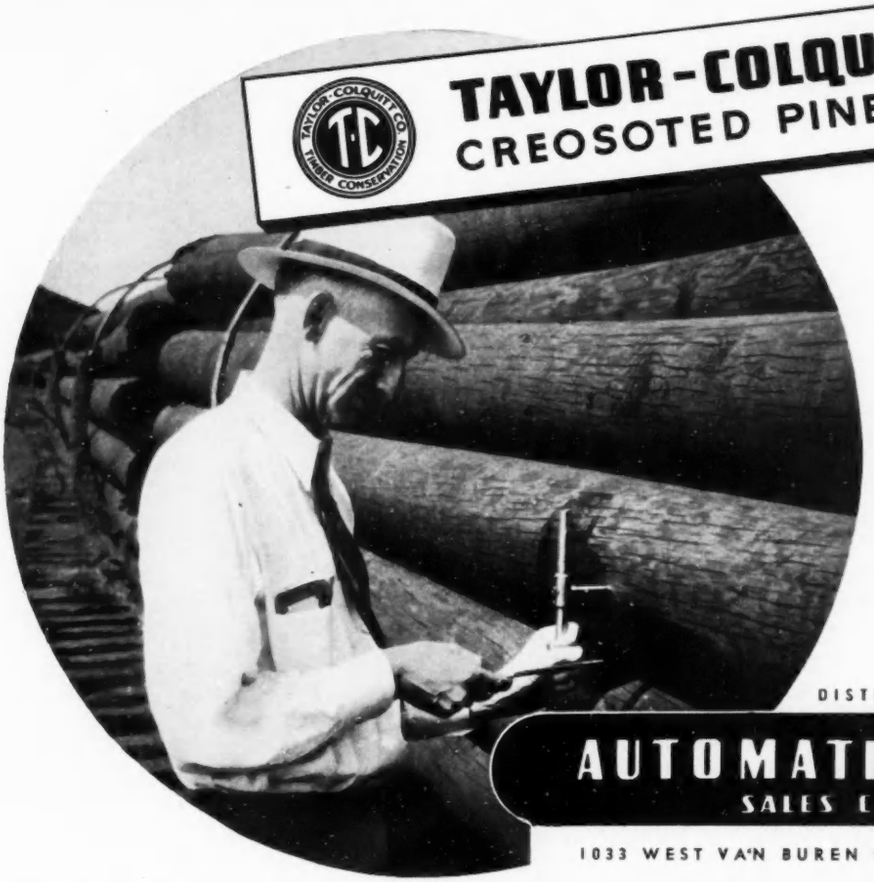

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Merger of Phone Lines Started Again

A step which may lead to the consolidation of the Wind Lake (Wisc.) Telephone Co. and the Burlington, Rochester & Kansasville (Wisc.) Telephone Co. was taken last month in the stockholders' approval of the sale of the company to Hulbert Thompson, present supt. of the Wind Lake Company, who announced plans to consolidate with B.R.&K. if a satisfactory deal could be arranged.

The sale, however, is subject to the approval of the public service commission, as is also any plan for reorganization. Doubtless any plan that contemplates reorganization will have to include some provision for acquiring and absorbing the Rochester company, since public convenience and necessity will probably be factors that will enter into any consideration when the plan is placed before the public service commission at Madison for approval. Whether Major Wallis, the present majority stockholder of the Rochester company will entertain a purchase proposal by the present company is not known.

Reorganization plans, although not yet settled upon, will probably include a limitation in the number of shares any one person may own, together with the provision that any stock owned must first be offered to the company before it may be sold to a second party. These provisions, they feel, will protect stockholders and subscribers alike from a small group of persons getting controlling interest in the corporation, a point which was hotly disputed last July when efforts were made to negotiate with the Rochester company.

The issue was first raised for serious consideration early last year when the Wind Lake company made application to the public service commission of Wisconsin for permission to install common battery or dial service for its subscribers in the Waterford area. Extension of the Wind Lake lines was also contemplated to care for the great demand for telephone service which under present equipment limitations, was not possible.

The move was opposed by the Rochester Co., which raised the issue that any competition by one company would have to be met by similar competition and service by the other company but, after due consideration, Wind Lake was given permission to proceed. It was actually this that set off the idea of merging the two telephone companies serving this area and a hearing in the village hall with this in view was held in October of last year before a panel of the public service commission. Both sides held out for certain conditions, and finally the issue died a natural death, but wasn't forgotten, by any means, for a large number of the Wind Lake people still wanted consolidation if their little company could be assured of protection from monopoly through stock limitations.

Transfer Line

The Oldtown (N. C.) Telephone Company on suggestion of the North Carolina Utilities Commission agreed to sell one of its lines to the Southern Bell Tel. & Tel. Co., since the line in question was judged in the Southern Bell's Winston (N. C.) exchange territory. The Commission approved the sale of the line at $2,000 and ordered the sale carried out by June 16, 1946.

Acquires Two Exchanges

The Lakedale Telephone Company now operates in both Maple Lake and Annandale, Minnesota since it received authorization March 1 from the Minnesota RR & Whse. Commission to purchase the Maple Lake and Annandale telephone companies and to operate them under the Lakedale name. Present rates at both exchanges are to continue unchanged.

What Counts in Cords

- Tinsel that won't break!
- Braid that won't fray!
- Insulation that won't leak!

These are top-quality features that you find in all

MOISTURE-PROOF

RUNZEL CORDS

A complete stock on hand at

SUTTLE EQUIPMENT CO.

DEPEND ON SUTTLE

DEAD ACCURATE
EASY TO USE

Takes out guesswork of "sight and sag", or oscillation wire stringing. Hooked on in a jiffy. Indicates tension in seconds. Measures only 8¼" x 6¼" x 3". Capacities 500 to 20,000 lbs.

A Lot of Critical Testing to Do

MAKE SURE WITH THE

DILLON DYNAMOMETER

The Dillon is universally used in telephone work. Accuracy, and long-lived dependability are the answers. Indicates exact tension in guy strand, messenger and wire.

Many other uses where pull, torque, weight or overload are vital factors.

Write, wire or phone for illustrated Dynamometer Manual.

W. C. Dillon & Co., Inc.
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The MAGNETIC MAP

IN some telephone exchanges it is customary to have a large map of the city and rural area mounted on a wood panel beside the wire chief's or dispatcher's desk. By means of colored pins which are inserted in the map, the location of trucks and maintenance vehicles or even repair men on foot can be shown. This arrangement expedites the efficient handling of men and vehicles.

An improvement on the usual dispatcher's map and colored pin arrangement has been made by one telephone company. Instead of using a map pasted on a wood backboard, the map is pasted on a large sheet of galvanized iron. Small color coated *alnico magnets* are used to show the location of vehicles and men. The magnets stick tightly to the map and yet they can be removed without difficulty. Small alnico magnets are available from various specialty houses and the arrangement just discussed is recommended to any company that wants a neat, convenient and novel dispatcher's map. Fig. 1 illustrates the general features of the plan.

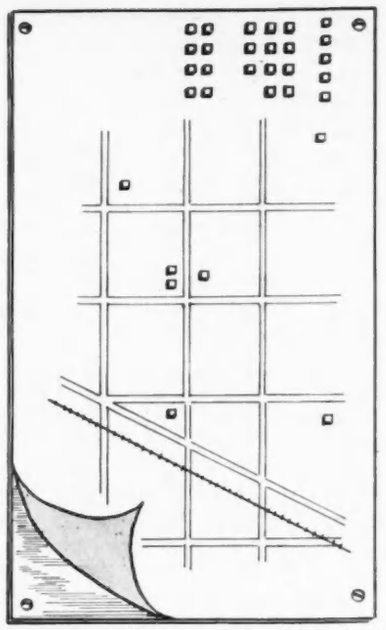


Fig. 1—Use of magnets for dispatcher's map.

Selling RURAL SERVICE

IN spite of all the fuss that has been made about many farmers being without needed telephone service, the real problem has been to convince the farmers that telephone companies should be permitted to install a telephone for them. Believing that many farmers who do not have telephone service, realize its value, one progressive telephone company set out to discover just what use existing subscribers were making of their telephone service.

Over 4,000 farm telephone users living in 45 exchanges in 9 states were invited to give answers to a number of questions regarding their farm telephone service. The question dealt largely with the value of the telephone to a farm family and the kinds of uses to which the telephone is put.

Surprisingly good results were obtained from this campaign. Over 69 percent or 2,769 farmers who received copies of a *survey booklet* sent out responded.

Use of the Telephone

About how often is your telephone used for the following purposes in OPERATING YOUR PLACE? (Please check for each use indicated.)

	Fairly Often	Not Very Often
Ordering repairs, parts, etc.	✓	
Ordering feed and supplies	✓	
Loaning or borrowing farm equipment		✓
Trading help	✓	
Keeping in touch with buyers (getting prices, etc.)	✓	
Handling produce	✓	
Selling direct to consumers		✓
Calling the County Agent	✓	
Calling the veterinarian	✓	

About how often is your telephone used for the following purposes in RUNNING THE HOUSEHOLD? (Please check for each use indicated.)

	Fairly Often	Not Very Often
Buying things by telephone	✓	
Obtaining services (household help, painter, etc.)	✓	
Making appointments (doctor, dentist, etc.)	✓	

Fig. 2—Sample page from rural subscriber survey booklet.

The booklet survey brought in much useful information as to the various applications the average farmer made of his telephone. It also served to focus the attention of the farmer on the value he could get from his telephone if he made full use of it.

It is interesting to note that over 42% of those responding to the request for information found that the telephone was *absolutely necessary* on the farm; 36% felt that it was necessary but not indispensable; thus, over 78% of the present farm telephone users considered their telephone a necessity. Only 15% thought the telephone a convenience, and 4% of those responding felt that it was a luxury. Forty-eight percent of the rural users considered business as one of the most important reasons for having a telephone.

Here is an idea that Independent companies might well follow, as the cost of the small booklet is negligible compared to the value that might be received from it. Booklets of this type must be carefully prepared otherwise they are unlikely to be read and a reply received from them. A sample page from the booklet mentioned is shown in Fig. 2.

DILLON BISECTOR

A QUALITY TOOL WITH A REAL PURPOSE

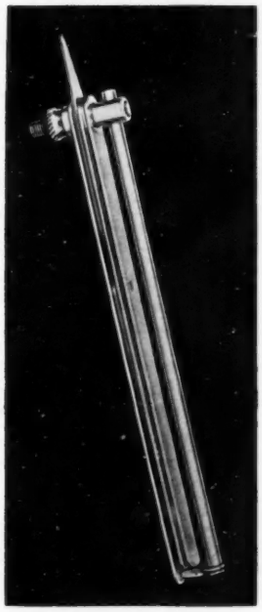
ACCURATELY LOCATES ANCHOR POSITION AND INDICATES AMOUNT OF PULL

EASY TO USE-RUGGED COMPACT-LIGHT WEIGHT

Photograph above shows Bisector in actual use. Spiked tip is driven lightly into pole to be guyed, and arms are aimed at poles to right and left. Operator adjusts peepsight barrel over center of each arm in turn until it is perfectly aligned with the right and left poles. Tailpiece then automatically indicates *correct* position for anchor. Anyone, without slightest experience, can obtain *perfect* results with the Dillon Bisector on the very first try.

$4.95 F.O.B. CHICAGO

COMPLETE WITH CASE



ELIMINATES GUESSWORK

The Dillon Bisector not only indicates correct anchor *position* but it *also* registers *pull* and *interior corner angle degrees!* By checking scale readings, (see photograph above), with the following table, operator obtains pull at a corner in *degrees* and load in *percentage* at a dead end. This information determines correct size of guy strand to use.

Pull Feet	*Interior Corner Angle Degrees*	*Resultant Force (Percent of Load at Dead End)*
10	168	20
20	157	40
30	145	60
40	133	80
50	120	100

A load on a corner pole at which there is a 20-foot pull, (157 Interior Corner Angle), is 40% of that at a dead end pole. At a corner at which the pull is 50 feet, the load on the pole equals that at a dead end, etc.

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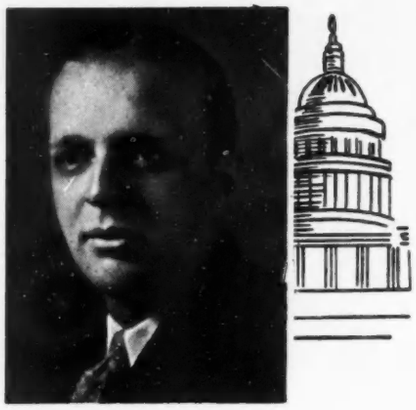
Roland C. Davies
Editor
Telecommunications Reports



Our WASHINGTON *BUREAU Reports*

By
ROLAND C. DAVIES
and FRED HENCK

A MARKED increase of emphasis on mobile radiotelephone services highlighted recent Washington developments in the telecommunications field, as the FCC began study of a new policy of mobile radio regulation, with the probable outcome the issuance of five-year licenses and the relaxation of restrictions on experimental service provisions. At the same time, a steadily-increasing number of applications from carriers has been received, and many components of the telephone operating-manufacturing industry are accelerating their plans to move into the mobile field.

Although the spotlight was focused on mobile services, it did not wholly overshadow other important news breaks of interest to the telephone industry. Included in those were the apparent death blows struck at the Administration's 65-cent minimum wage, continued advancement of the candidacy of Montana's J. Burke Clements for the vacant FCC chairmanship, the indications that the drastic CPA construction ban will have no great effect on the telephone field, and the moves of several Independent companies' employees' unions to affiliate themselves with the National Federation of Telephone Workers.

Mobile Policy Pushed

Following a heavy volume of informal requests by telephone and transportation concerns—the latter including motor, freight trucking and taxicabs—for a blueprint of the future of mobile radiotelephone service in the form of definite regulations, the FCC has launched a study of the field, in an attempt to evolve a policy to insure stability of equipment investment and to stimulate operations in highway and urban mobile services.

Although the broadcasting log jam of work, including the large number of FM and television applications, will preclude immediate action by the Commission, that agency is planning hearings on the subject. **One major question to be cleared up is whether the Commission will place responsibility for the development of highway and urban mobile radiotelephone in the hands of the telephone companies or in those of the transportation concerns.** Another possibility, of course, is that the services would be provided by a combination of the two.

It is expected that a five-year licensing period, as well as relaxed experimental license provision to permit commercial use of the mobile services, will come eventually from the Commission's study. The five-year license is considered the best answer to the transportation companies' point that they need a safeguard for their capital investment in equipment installations and radiotelephone operations.

The bus and truck operators consider their problems similar to those of the railroads, which were granted public service rules by the FCC early this year. They have asked the formulation of experimental rules which will permit the full growth of mobile services. Taxicab companies, also, consider themselves public utilities, and are especially interested in protecting the effort and money they will put into the new services. At the present the transportation outfits are reluctant to buy equipment which may later be made obsolete by future revisions of engineering and frequency standards. At the same time, the manufacturers have been slow to produce apparatus which might be outdated in the immediate future should the frequencies or technical standards be changed.

Large-scale experimentation on a commercial basis—there is precedent for such a program in the radiotelephone operations of the Bell System—is believed by the FCC to constitute the best basis for a solution. The data and results obtained would provide an excellent evaluation of the services when the hearings are staged, as well as a comparative analysis of the benefits of operations by both telephone and transportation companies.

As the Commission plans its study, Independent companies are showing heightened interest in the use of radiotelephone. This has been exemplified in recent applications to the FCC. The Union Telephone Company of Owosso, Mich., in the most unusual license request, has announced its plans for radiotelephone short-haul toll operations, in which the Automatic Electric Company, which owns the carrier equipment (Lenkurt), is understood to be participa ing.

Meanwhile, two Independents—the Associated Telephone Company of Santa Monica, Cal., and the Mutual Telephone Company of Hawaii—have applied for mobile radiotelephone facilities. Associated has projected urban mobile service, with a land station at Signal Hill, Cal. and 50 portable mobile units, while Mutual is engaging in general mobile Service, using land stations at Honolulu and Waipahu and portable mobile units for the tests.

NARUC Committee Vacancies Filled

With its major work for the year expected to be the drafting of the report on license contract payments, the NARUC Committee of Five cooperating with the FCC in telephone regulation again has its full quota of members. The two vacancies were filled

Convention Dates

National Executive Conference, USITA, Edgewater Beach Hotel, Chicago, Illinois, April 16 and 17.

Forestry - Conservation Communications Association, Region 2, Southern States, Whitley Hotel, Montgomery, Alabama, April 17, 18 and 19.

Ohio Telephone Association, Deshler-Wallick Hotel, Columbus, April 23-24.

Indiana Telephone Association, Severin Hotel, Indianapolis, May 1-2.

Illinois Telephone Association, Pere Marquette Hotel, Peoria, May 8 and 9.

Wisconsin Telephone Association, Park Hotel, Madison, May 14, 15 and 16.

New York Telephone Association, Hotel Onondaga, Syracuse, May 22 and 23.

Pennsylvania Telephone Association, Hotel Roosevelt, Pittsburgh, June 6 and 7.

Oregon Telephone Association, Multnomah Hotel, Portland, June 21 and 22.

California Independent Telephone Association, Miramar Hotel, Santa Monica, June 27 and 28.

Michigan Telephone Association, Hotel Olds, Lansing, September 18 and 19.

USITA National Convention, Stevens Hotel, Chicago, Illinois, October 14, 15, and 16.

North Carolina Telephone Association, Pine Needles Hotel, Southern Pines, November 11 and 12.

Alabama Telephone Association, Jefferson-Davis Hotel, Montgomery, November 18 and 19.

with the appointment of Chairman Fletcher Plumley of Vermont and Missouri Commissioner Kyle B. Williams by NARUC President John D. Biggs, the Illinois Commerce Commission Chairman.

Commissioners Plumley and Williams will work with Committee Chairman H. Lester Hooker of the Virginia Commission, R. Frank Morgal of Pennsylvania and Ray O. Weems of Oklahoma. The FCC's Telephone

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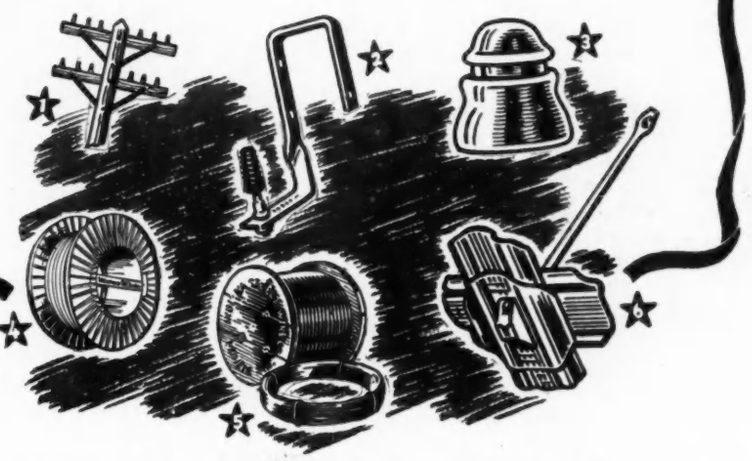

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★ WESTERN ELECTRIC CABLE ★ WIRE, STRAND ★ EXPANDING ANCHORS

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IN OVER 90 PRINCIPAL CITIES

Thumbnail Sketch of Rosel H. Hyde

A merit selection of the highest quality—of a career government official who has risen steadily through the ranks to the top—was the nomination by President Truman March 21 of FCC General Counsel Rosel H. Hyde to the Republican vacancy on the Commission. Approval by the Senate Interstate Commerce Committee is certain and Senate confirmation may be expedited because the FCC now is operating with only five Commissioners.

Mr. Hyde, who has served continuously since 1928 with the former Federal Radio Commission and the FCC, will become Commissioner for the balance of the unexpired term until June 30, 1951, of the late Governor William H. Wills, who died from a heart attack at Brockton, Mass., March 6.

During his entire career, Mr. Hyde has been primarily assigned to, and interested in, broadcasting questions. If he needs any "brushing up," it would be on communications matters. As general counsel, Mr. Hyde is known to have let Assistant General Counsel Benedict P. Cottone, through his Division, handle communications questions virtually without supervision.

Commissioner - designate Hyde, who is 46 years old and was born in Idaho, came to Washington in 1924 after studying at the Utah Agriculture College. A Mormon, Mr. Hyde has always maintained his voting residence in Utah as a Republican. He served for four years with the Civil Service Commission and joined the old Radio Commission in 1928 as Chief of the Docket Section. Studying law at night and graduating from George Washington Law School in 1929, he joined the Radio Commission Law Department as an examiner in 1932 and two years later became an attorney-examiner of the FCC. He rose to the post of Assistant General Counsel in October, 1942.

Rosel H. Hyde

Committee is composed of Commissioners Walker, Wakefield, and Durr.

No 65-Cent Minimum Wage

Hope for a speedy Senate decision on the embattled minimum wage situation had faded some time before TELEPHONE ENGINEER & MANAGEMENT went to press, but it appeared that establishment of a 65-cent minimum, with graduated increases up to 75, was extremely unlikely.

This appeared even more certain after the Senate defied an unprecedented veto threat by President Truman, transmitted to the upper chamber through Majority Leader Barkley, in which the Chief Executive declared that he would refuse the measure if it came to him with the Russell amendment to include farm labor costs in computing farm parity. In the face of this pronouncement, the Senate went ahead and approved the Russell proposal by a 43-31 vote, with the Democratic majority voting 24-21 in favor of the amendment despite the Administration position.

Of course, on the face of it, the forces favoring the Russell amendment could not muster the necessary two-thirds vote to override a veto. But the Administration is attempting to get a bill passed, not have one turned down. It must also be remembered that apparently the Russell proposal was another of the restrictive amendments loaded on the Pepper measure by the opposition forces to pull the minimum down to a 55-cent level. Thus passage of the amendment is considered an almost certain sign of one of two possible eventualities—(1) passage of the Ellender-Ball amendment, calling for a 55-cent wage floor, with progression up to 65 cents, or (2) a compromise straight 60-cent minimum with no progression.

Other than a blast by Senator Taylor (D. Ida.), who is in favor of the Pepper legislation, the Independent telephone industry has not figured in the lengthy debate on the subject. Senator Taylor said the Independents could pay a 65-cent wage and still "make more money than ever before," but he did not attack directly the raising of the exemption on Independent exchanges from 500 to 1000 stations, and there appeared to be no organized sentiment against the boost in the exemption.

Hyde Confirmation Delayed

For no apparent reason except the heavy work load with which it is faced, the Senate Interstate and Foreign Commerce Committee had not launched action on the confirmation of Rosel H. Hyde to the FCC as this column was written. Indorsement of Mr. Hyde after short hearings, probably in executive session, is considered the likely result when the Committee can free itself of its present work backlog—primarily railroad legislation — long enough to take up the matter.

The other Commission opening, the vacant chairmanship, still is the subject of many rumors and no concrete developments. Only significant occurrence of past weeks in this line was the White House introduction of J. Burke Clements, Montana State Unemployment Compensation Chairman, by Senate Commerce Committee Chairman Wheeler. The Senator indorsed Mr. Clements for the post several weeks ago, and President Truman expressed a desire to meet Senator Wheeler's candidate.

So long as Mr. Hyde's confirmation is delayed, there will be no action on an appointment of his successor as general counsel. The three general counsel assistants—Benedict P. Cottone, Vernon L. Wilkinson, and Harry M. Plotkin—are considered the leading candidates. Possibly Mr. Cottone —who is the most familiar with the telephone industry because he is in charge of the FCC's Common Carrier Division— is the most likely possibility, due to his greater seniority and the fact that he served as acting general counsel when Mr. Hyde attended the Bermuda Telecommunications Conference.

Building Ban Should Have Little Effect

Three important aspects of the critical building situation, implemented by the housing limitation order of the Civilian Producton Administration, indicate that the Independent telephone industry should not be hampered seriously by the construction restrictions.

First, in recognizing the essentiality of the telephone service, as did its predecessor, the WPB, the CPA included the industry among those which are permitted to build structures of up to $15,000 in cost without restriction. Second, the order pertains only to buildings themselves, and their mechanical equipment (plumbing, heating, lighting, etc.) and not to operating equipment like telephone plant. Third, approval may be gained more easily in the small towns, where the housing situation is sometimes not quite so critical as it is in congested metropolitan centers.

Meanwhile, the CPA is implementing its order with the formation of 71 regional construction offices, to be located in FHA agencies, with a citizens' advisory committee for each. The committees—to be composed of leading citizens, builders, etc.—will make recommendations on the essentiality of each application, but the CPA construction office manager will have decisive authority. His findings, however, may be appealed to Washington.

Unions Look Toward Independent Field

A definite move toward the Independent telephone field has been launched by the major telephone employees' unions, the National Federation of Telephone Workers and the former Long Lines Federation, which has changed its name to the American Union of Telephone Workers. The latter is an NFTW affiliate, and it was emphasized that the name change was not indicative of a split in the union's ranks—it is part of a program whereby the American union can extend its activities, both in non-NFTW territories and the Independent industry.

At the same time, several unions of Independent employees have moved toward NFTW affiliation. The employees of the Ashland, Ky., Home Telephone Company, recently acquired by the General Telephone Corporation, have indicated a desire for NFTW affiliation, and an NLRB election is to be sought to clear up the issue between joining the national federation and the workers' present AFL link.

Also, the workers of two Pennsylvania Independents, the Peoples Telephone Corporation of Butler and the Meadville Telephone Company, are seeking NFTW membership. With its Bell System affairs pretty well straightened out for the time being, it is expected that the national union will launch definite efforts to bring Independent workers into the fold.

Surplus Disposal Unchanged

The reorganization of the former War Assets Corporation, now known

Maintenance Men are Happy
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Soldering Irons - Rheostats - Solder Pots - Ladles

In addition to 14 standard sizes of Screw Tip and Plug Tip type of electric soldering tools, VULCAN makes special tools to fit any job.

Unusual VULCAN Features

Protected windings, hermetically sealed, prevent damage by flux fumes oxidation, water, etc.

Purest hard forged copper tips, tinned ready for use and easily replaceable.

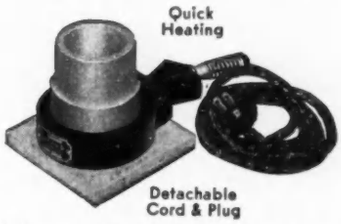
Ventilated handles, cool and comfortably shaped to fit the hand.

Fireproof, protected terminals relieve cord strain.

Current consumption very low. Less costly to operate.

Catalog No. 35—Plug Tip construction 3/4" tip. Rated 100 watts. Soldering Iron is ideal for telephone work.

Electric Soldering Pots

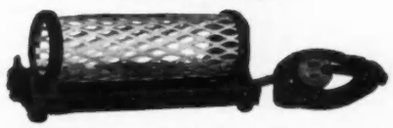


High Speed and Standard. Cast in one piece to a square base of heat resisting material. Flat type element is easy to replace. A dependable pot.

Solder Pouring Ladle

Capacity 7½ lbs. of solder. Quick, efficient heating. Cast iron pot. Cartridge unit of 200 watt, easily replaceable.

TOOLHOLDER



The TOOLHOLDER holds and guards the soldering tool when not in use. Rubber feet are provided so that it will not scratch or mar a highly polished surface. With or without thermostatic control.

RHEOSTATS provide more flexible and accurate temperature control of electric soldering tools and protect them, when not actually delivering their working heat by preventing the unused heat from storing up. Protecting the "tinning" from burning off the tip thus prolonging the life of the heating element in the tool.

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The ***VULCAN*** Tools represent absolute quality, are accurately manufactured and tested, and are guaranteed perfect in both materials and workmanship. We specify no period of free replacement nor do we set a one year limit on our guaranty, but we will make good any VULCAN Tool in which our investigation shows any manufacturing fault.

TRADE VULCAN MARK
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DANVERS, MASSACHUSETTS

as the War Assets Administration, has left the disposal of communications-electronics surplus goods right where they were before. The Electronics Division, which administers sales of telephone equipment, is still under the Capital and Producers Goods Division, and Robert G. McCurdy, who replaced W. C. Foss about a month ago, remains as chief.

Although one of the announced policies of the new WAA Administrator, Lt. Gen. Edmund B. Gregory, wartime Quartermaster General, is decentralization, Mr. McCurdy told TELEPHONE ENGINEER that Washington will continue to administer all sales of communications surpluses. He said that the work continues exactly as before, with no changes or revisions under the new setup.

International Merger Still Studied

Study of the international communications merger by a committee of the interdepartmental Telecommunications Coordinating Committee is taking longer than had been expected, and probably will require a total of four weeks for its completion. The original estimate had been two weeks, but despite the subcommittee's daily sessions the multi-faceted problem is requiring considerable time for a full examination.

The Committee is working on the tentative agenda for the forthcoming World Telecommunication Conference, and recommendations for additions and revisions will be presented by the various Government agencies concerned at its next meeting. In the meantime, the Bureau of the Budget has been added as a Committee member, and it is expected that its representative will be Paul David, a Fiscal Division staff officer.

Purchase Iowa Exchange

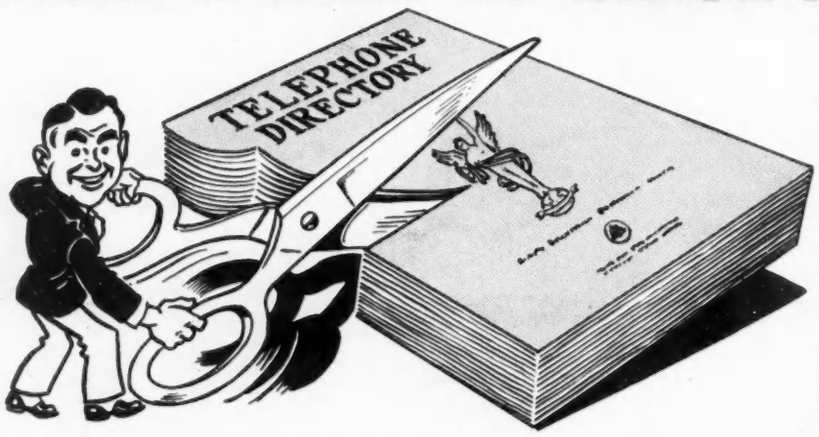
In order to eliminate duplication of telephone service in an Iowa town, the Northwestern Bell Telephone Co. has filed a petition with the FCC for the acquisition by purchase of the Stuart, Ia., exchange of the Iowa State Telephone Co. The purchase is comparatively minor, being $4,500, but the acquisition petition presents the interesting aspect of eliminating another of the troublesome duplicate telephone systems—a smaller scale of the Keystone situation in Philadelphia.

Because Iowa is one of the three states without a utilities regulatory commission, the FCC will be the only governmental agency to pass on the Northwestern Bell acquisition. The petition, which was filed by F. R. Kappel, vice president; Tracy C. Peycke, vice president and general counsel; and Harris A. Poley, attorney, of Northwestern Bell, stated that Northwestern Bell in consolidating the Independent company's exchange (serving 128 town and 209 rural subscribers) would eliminate the Independent's magneto facilities and all deteriorated plant, replacing it with common battery service.

Expansion Program

The Munising (Mich.) Telephone & Electric Company has planned a considerable expansion of its telephone facilities, according to W. A. Tidd, manager. A 40% growth during the past three years has been accomplished in Munising's service and this summer they expect to re-cable much of the system and put many of the lines underground to eliminate poles, possible interference from weather and other factors and also to cooperate in keeping the city attractive. Several years ago the company undertook a program to move its poles and lines away from streets and to eliminate them wherever possible from public view and interference. Part of the expansion called for this summer will be the installation of new switch-

Don't cut it short



IT is *not* necessary to cut short your opportunities for increased revenue from Directory advertising in favor of other services or considerations. You don't have to cut yourself off from concentrated sales efforts and careful handling.

In 1944, the Loomis Co. took over advertising sales for the Oklahoma Tel. Co. . . . Directory advertising revenues showed a sharp rise, increasing 130.53% over 1943. Reacting to careful, concentrated sales methods, 1945 revenues rose to 176.32% over 1943! From an actual case in the Loomis files. Full details on request.

The Loomis Advertising Company has handled $28,000,000 in advertising sales in the past 22 years, has the experience necessary for combining concentrated sales efforts (for today's profits) and careful handling (for tomorrow's goodwill).

No matter how large or small your account, any representative listed below will be glad to discuss with you the Loomis plan for increased revenue from telephone directory advertising. Roland T. Beard, Vice-president, Gettle Bldg., Ft. Wayne, Indiana and Wesley H. Loomis, Jr., President, personally invite your inquiry.

Loomis ADVERTISING COMPANY

502 Gettle Bldg., Ft. Wayne 2, Ind.

506 Olive St., St. Louis 1, Mo. — 20 West 9th St. Bldg., Kansas City 6, Mo.
Omaha Nat'l Bldg., Omaha 2, Neb. — 6908 Market St., Upper Darby (Phila.) Pa.

board equipment which will improve local service considerably.

Already on hand for this year's job are 6,600 feet of 50-pair cable, and efforts are being made to get other material and equipment. The cost of the project was estimated at around $8,000. Four to six extra linemen will be employed in the work.

At present there are 725 telephone subscribers in Munising, and 50 more telephones will be added as soon as they can be obtained.

Rate Increase Forecast for Dial Conversion

The Kentucky Public Service Commission has left the door open for a rate increase to cover the cost of conversion of the Lexington Telephone Company's Lexington, Ky. exchange from manual to rotary dial automatic operation in a decision of considerable importance to the entire telephone industry.

In approving the $2,040,000 construction permit to modernize the exchanges, while dismissing without prejudice the request for an immediate rate boost, the Kentucky Commission viewed favorably the company's position and declared that its application and exhibits "constitute ample basis to support the proposed increase in rates." The Commission in its decision emphasized, however, that presently fluctuating costs make it difficult to estimate accurately the exact cost of conversion, and suggested that a proper study of the rate increase request could better be made when dial operation is completed, probably in about two years.

The decision, which undoubtedly will be applied as a precedent in future actions as the entire industry prepares to rehabilitate war-weary plant and convert to the most modern methods of operation, specified that there need not "be any delay in making the new rate schedule effective after conversion. The company may file at that time such cost data and revised estimates as may be pertinent, and make the new rates effective immediately."

The Lexington Telephone Company, in its rate increase application, which was opposed by the City of Lexington and the OPA, declared that it would be better able to obtain the capital to finance the conversion if the rate boost were put into effect immediately. The Commission—Chairman Thomas B. McGregor and Commissioner Charles E. Whittle rendered the decision—said that it could consider the proposed increase "more intelligently after the actual costs of conversion are known, and when estimates of operating revenues and expenses can be based upon conditions then prevailing."

Without Damage to Insulation—with

KEARNEY SNUB-R-GRIPS

This effective drop wire grip has amazing holding power through snubbing action, yet it does not damage the insulation. It's easy to take up or pay out slack after the grip has been installed by inching the wire through the grooved spiral. Snub-R-Grips are easily installed or removed.

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Overhead and Underground Utility Equipment

UNSURPASSED for Generating Telephone Signaling Tones

LORAIN
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TONE GENERATOR
7 HIGH TONE LEVELS **6** LOW TONE LEVELS

NO MOVING PARTS
RELAYS
CONTACTS (Vibrating)
NOISE FILTERS
VACUUM TUBES
Operating Maintenance ADJUSTMENTS

Operates directly from the regular 60-cycle commercial A.C. supply and the High and Low Tones are produced by making use of the harmonics generated when a magnetic material is saturated.

Model "A", is arranged to operate on 105-125 volts 60-cycle commercial A.C. supply.

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LORAIN, OHIO

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. . . to handle and sell a wide variety of

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SINCE 1918

Radio Communications Electronics

some calls take the high road

Few people realize that radio, too, plays its part in the transmission of telephone messages. Yet this technique is one of the most striking examples of telephone research, development and progress.

Telephone advertising now tells the story. The advertisement on the opposite page appears in national magazines during March and April. It indicates the telephone industry's policy of using every means to give better service and more service to more people.

AN ADVERTISEMENT OF THE BELL TELEPHONE SYSTEM

Your telephone uses wires and radio

Maybe you've thought of the Bell Telephone System as using only wires. It uses and pioneers in radio too.

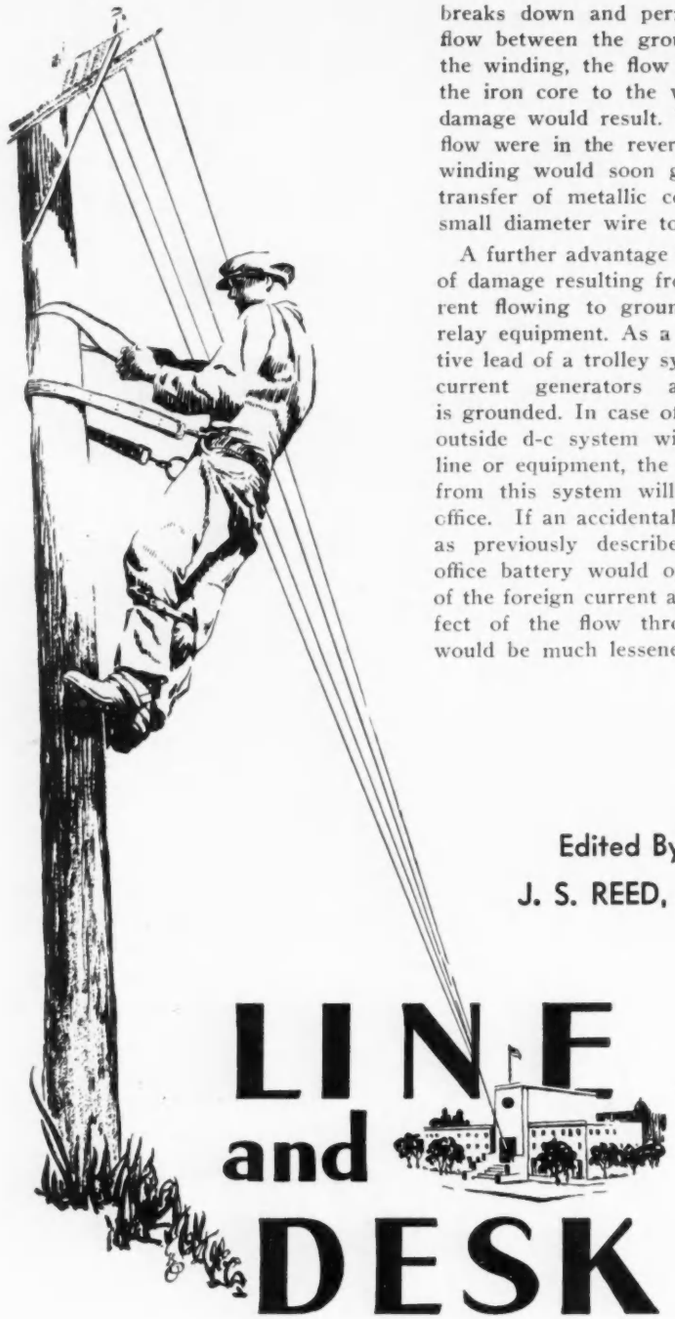
Through radio voice-ways it reaches across the seas to the world's telephones. At home, radio waves carry your calls across water barriers.

Radio links provide mobile telephone service for vessels plying inland waters and for ships at sea. Before long, such a service will also be available for motor vehicles.

Work is moving right ahead on an experimental radio relay system to carry Long Distance calls and television programs between New York and Boston. A similar system is planned between the cities of Chicago and Milwaukee.

In every case the Bell System uses the kind of transmission, wire or radio, that gives best service at lowest cost.

BELL TELEPHONE SYSTEM



Edited By
J. S. REED, JR.

LINE and DESK

breaks down and permits current to flow between the grounded core and the winding, the flow would be from the iron core to the winding and no damage would result. Whereas, if the flow were in the reverse direction, the winding would soon go open due to transfer of metallic copper from the small diameter wire to the core.

A further advantage is the reduction of damage resulting from foreign current flowing to ground through the relay equipment. As a rule, the negative lead of a trolley system or direct-current generators and converters is grounded. In case of contact of the outside d-c system with a telephone line or equipment, the foreign current from this system will flow into the office. If an accidental ground occurs as previously described, the central office battery would oppose the flow of the foreign current and the total effect of the flow through the fault would be much lessened.

Q. What is the general practice in regard to grounding the central office battery? Which side of the battery is grounded and why?

A. The general practice is to ground the positive side of the central office battery, though a few offices are found with the negative lead of the battery grounded. The theoretical reason for this practice is to protect relays and other delicate central office equipment from damage to any of these units by electrolysis in case of an accidental ground. For example, if the insulation between a relay winding and its core

Free Help on Problems

If you don't see a ready answer to your questions, let TELEPHONE ENGINEER's staff of technical men tackle it for you. This is a free service. Your question and the resulting answer may not only solve your problem but help the many other telephone men reading these columns. Jot your questions on a postcard and look to LINE and DESK for reply. If your problem needs immediate attention, please enclose a stamped addressed envelope for mail reply.

Q. We notice that when we install a telephone instrument near fluorescent lights we experience trouble with hum in the line. We wonder if these lights are causing this induction and if so, what would be the remedy?

A. It has been found that fluorescent lights do cause inductive interference if the inductance coil of the telephone instrument is located close to the light fixture. Wall sets, bell boxes, and self-contained sets should be kept at least 1 foot away from 20-watt fluorescent lamps and at least 2 feet away from 40-watt units. (Incidentally the same trouble occurs to a greater degree in the case of instruments mounted near neon signs. In these locations, the telephone instrument must be kept as far away as possible from the neon sign.)

Q. What should be the limit on the number of extension stations to place on the same line with a main station?

A. The following general rule for limiting the number of extension stations and/or extension bells on the same line with a main station has been found to result in satisfactory service to subscribers:

Class of Service	Maximum No. of Extension Stations, plus Main Station, including Extension Bells
Individual line station	4
Two-party line station	4
Four-party line station	2
Ten-party line station	2
Private branch exchange station	4

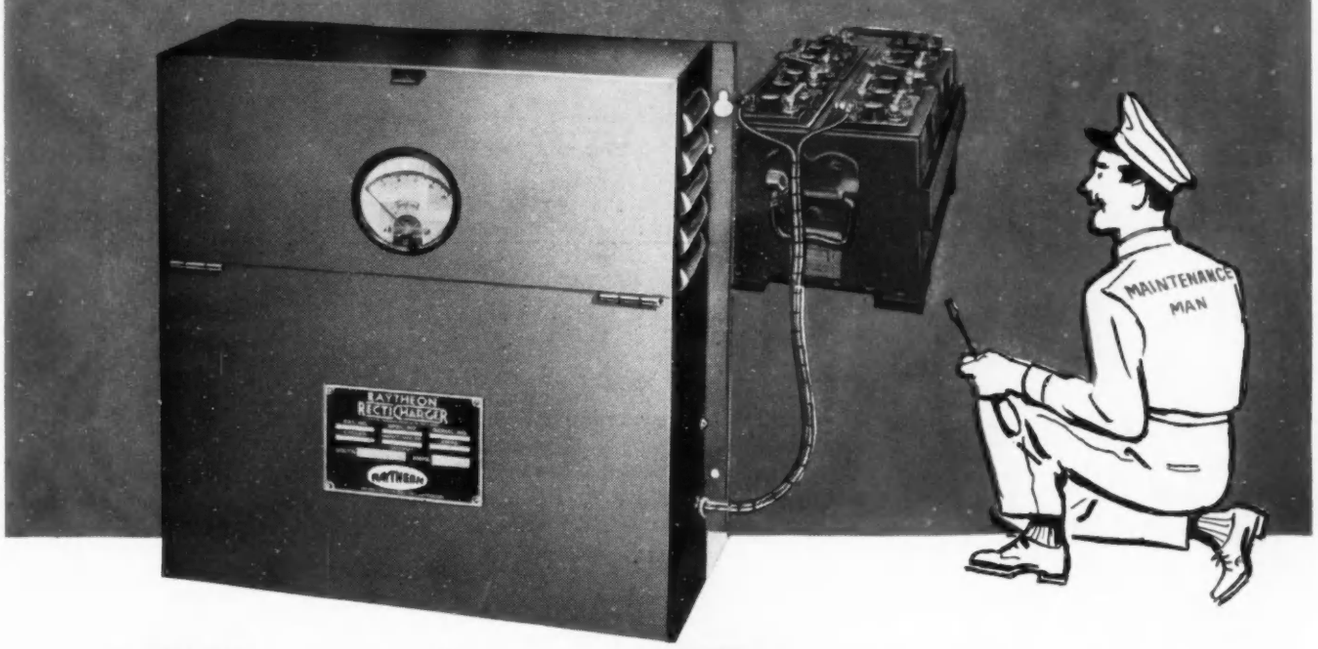
The limit prescribed above is particularly important in the use of dial exchanges where too many stations on one line would result in unsatisfactory operation of the central office equipment. The line capacity resulting from having a number of condensers permanently bridged across the line should never exceed 4 mf. If the station sets utilize a 2 mf. condenser, it will be necessary to connect the ringers of two sets in series with one condenser to reduce the line capacity where more than two sets are bridged across the line.

Q. How can we tell when a biased bell is correctly poled the first time it is connected to the line circuit?

A. One of our readers recently made a very good suggestion pertaining to this problem. He states that the test for a correctly poled ringer is to loosen the biasing spring and operate the dial or flash the hook switch. If the ringer is correctly poled, the armature on the ringer will pull towards the bell coil nearer the biasing spring, or in other words "with the spring."

ONCE A YEAR

it receives a visitor!



Raytheon Recticharger

gives trouble-free performance in UNATTENDED locations

ONE, or at the most two, routine inspections a year are usually all that's required! . . . to replace water lost by evaporation.

That's because the Raytheon Recticharger carries the normal telephone current demand—so battery activity is cut to a minimum, and water loss is slight. And since there are no moving parts—virtually nothing to get out of order—repairs are rare indeed.

The Recticharger, with a small battery floated across its terminals, provides a dependable, constant-potential battery-charger and AC to DC power unit for a wide range of automatic communication systems.

It has many other operating advantages. Study them, in Bulletin DL48-263B, fully illustrated. Send for it today.

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Excellence in Electronics

NEW PRODUCTS and Applications

Hydraulic Pipe Bender

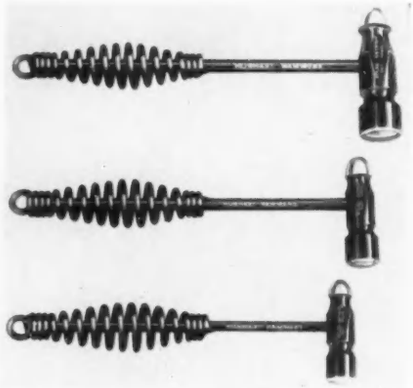
New hydraulic pipe bender, manufactured by Greenlee Tool Co., for use in central building projects or cable installation work where telephone company places conduit runs.

A new hydraulic pipe bender enables one man to make bends of any desired radius in conduit up to 4½ inches in diameter. Tremendous pressure is obtained with ease by the means of the hydraulic jack principle. This tool should prove useful in connection with central office building projects and in cable installation work where the telephone company is called on to place conduit runs. A free booklet may be obtained from the New Products Editor by your postcard request.

All Metal Hammers

The Ball-Pein hammer, manufactured by Atlas Welding Accessories Co., formerly had wood handles but now is available in all metal construction. These hammers are flame hardened for toughness with heads of fine alloy tool steel. The Flex-O-Handgrip is shaped to fit the hand and absorb shock. Because of the hammer's prolonged life of service as it is unbreakable, can't burn or split or come apart, Atlas Welding feel that this new all metal Ball-Pein hammer represents economy to all users.

For further information, please address a post card to Telephone Engineer Publishing Corporation, Chicago, Ill.



Several different models of the new all metal Ball-Pein Hammer.

Portable Tree Cutter

A new portable power driven one-man saw, called the "Sally Saw," is now available for tree clearing or heavy pruning work that can be done with great speed and little effort with this new piece of equipment.

The saw and 1½ h.p. gasoline engine weigh only 69 lbs. and will fell trees up to 11" in diameter. In sawing, the weight of the saw can be borne by the tripod leg under the motor and the saw support at the working end makes it convenient to support the cutting tool.

The specially designed circular saw blade operated by a shaft through driving gears has no center hub, so that the blade can saw all the way through timber. This saw can be removed in less than a minute for changing. Clutch control is provided by the handle near the motor end. A slight wrist motion controls the clutch.

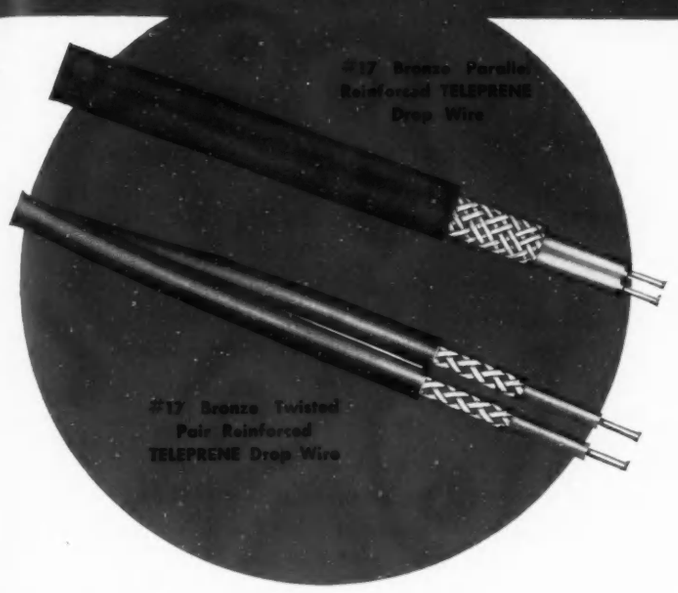
The Sally Saw is manufactured by the Cummings Machine Works, holders of 5 Army-Navy "E" awards, and now fully returned to civilian work.

For further information and prices on this convenient time-saving saw, please send a postcard to the New Products Editor, Telephone Engineer Publishing Corp., 7720 Sheridan Road, Chicago 26, Ill.

Pictured is the standard model of the Sally Saw, which will fell trees to 11 inches in diameter with one pass without notching.

TELEPRENE*

DROPWIRE



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17TB2-R Reinforced Twisted Pair
17TB2 Twisted Pair

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Pole Spacings and Classes of Poles for Wire and Cable Leads---Depth of Pole Settings

THE data shown for classes of poles utilized in the construction of open wire leads represent the experience of large Independent telephone companies. The classes of poles to select for a wire or cable lead will depend mainly on local conditions. In locations of severe exposure to storms, it is advisable to increase the pole size by at least one class. The effect of using one class larger pole is to increase the strength of the line by approximately 25 percent; whereas employing one class smaller poles will decrease the line strength by 20 percent.

Table No. 1 shows the minimum classes of poles recommended for use in constructing exchange and rural wire leads having the indicated average span lengths. Table No. 2 lists minimum pole classes for open wire leads with an ultimate of fifteen toll circuits or less. Table No. 3 indicates the smallest classes of poles that should be used when more than fifteen toll circuits are to be carried in the wire lead.

If cable is to be carried alone or with open wire, consider the cable as being equivalent to a certain number of open wires as shown in Table No. 4. Span lengths of cable vary between 90 feet and 150 feet and should never exceed the latter figure unless a special suspension span construction is employed.

Recommended pole setting depths for various pole lengths are listed in Table No. 5 which also shows the resulting pole heights above the ground level. In loose sandy soil, it may be necessary to set the poles deeper than indicated for ordinary soil.

Table No. 1—Classes of Poles for Exchange and Rural Open Wire Leads

No. of 109 B.B. Iron Wires in Lead	Classes of Poles for Span Lengths of: 150 ft.	175 ft.	200 ft.	225 ft.	250 ft.	275 ft.	300 ft.	350 ft.	400 ft
Heavy Loading District									
1 to 4	9	9	9	9	9	9	9	—	—
5 to 15	9	9	9	7	7	7	7	—	—
16 to 20	7	7	6	6	6	6	5	—	—
21 to 30	7	7	6	6	6	5	5	—	—
31 to 40	6	6	5	5	4	4	3	—	—
41 to 50	5	5	5	4	3	3	2	—	—
Medium Loading District									
1 to 15	9	9	9	9	9	9	9	7	—
16 to 20	9	9	9	9	9	7	7	7	—
21 to 30	9	9	7	7	7	7	6	6	—
31 to 40	9	7	7	7	7	6	6	5	—
41 to 50	7	7	7	6	6	5	5	4	—
Light Loading District									
1 to 30	9	9	9	9	7	7	7	7	7
31 to 40	9	9	7	7	7	7	6	6	5
41 to 50	7	7	7	7	7	7	6	5	5

Telephone Engineer Handbook Tables

Index—Pole Line Design
Date—April 15, 1946

Table No. 2—Classes of Poles for Open Wire Leads Carrying an Ultimate of Fifteen Toll Circuits or Less

No. of 109 B.B. Iron or 104 Copper Wires in Lead	Classes of Poles or Span Lengths of: 130 ft.	150 ft.	175 ft.	200 ft.
	Heavy Loading District			
1 to 15	9	9	9	7
16 to 20	9	7	7	7
21 to 30	7	7	7	6
31 to 40	7	6	6	5
41 to 50	6	5	5	4
	Medium Loading District			
1 to 15	9	9	9	9
16 to 20	9	9	7	7
21 to 30	7	7	7	7
31 to 40	7	7	7	6
41 to 50	7	6	6	5
	Light Loading District			
1 to 30	9	9	9	9
31 to 40	9	9	7	7
41 to 50	7	7	7	7

Table No. 3—Classes of Poles for Open Wire Leads Carrying more than Fifteen Toll Circuits Ultimate

No. of 109 B.B. Iron or 104 Copper Wires in Lead	Classes of Poles or Span Lengths of: 130 ft.	150 ft.	175 ft.	200 ft.
	Heavy Loading District			
16 to 20	6	5	4	3
21 to 30	5	4	3	2
31 to 40	3	3	2	1
41 to 50	3	2	2	—
	Medium Loading District			
16 to 20	7	7	7	7
21 to 30	7	7	7	6
31 to 40	6	6	5	5
41 to 50	5	5	4	3
	Light Loading District			
16 to 30	9	9	9	9
31 to 40	9	9	7	7
41 to 50	7	7	7	7

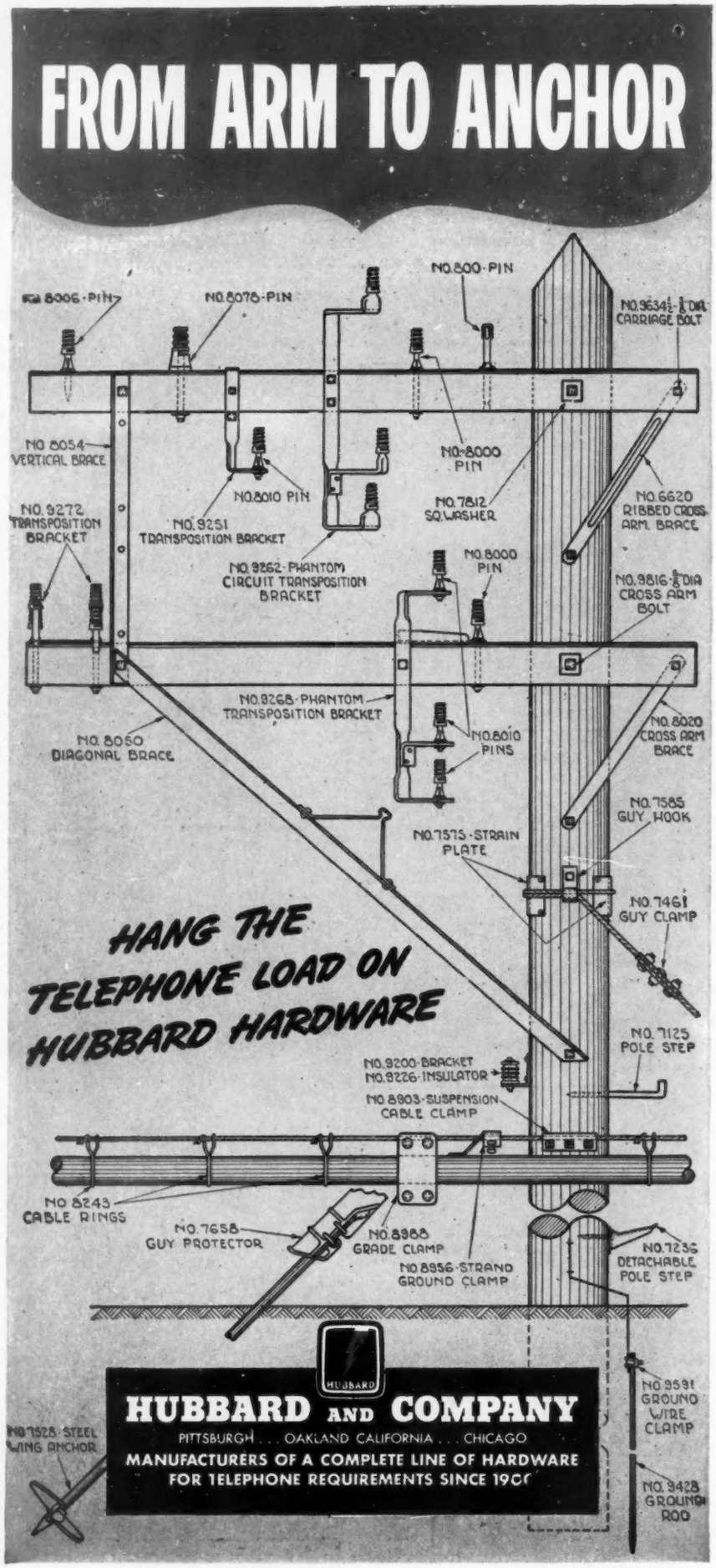
Table No. 4—Wire Equivalents for Cable and Strand

Size of Strand	Size of Cable Carried on Strand: 26 Ga. Cable	24 Ga. Cable	22 Ga. Cable	19 Ga. Cable	No. of Equivalent 104 or 109 Wires for: Heavy Load. Dist.	Medium Load. Dist.	Light Load. Dist.
6000 lb.	25 pr. to 300 pr.	25 pr. to 200 pr.	25 pr. to 150 pr.	25 pr. to 50 pr.	4	5	15
10000 lb.	400 pr. to 900 pr.	300 pr. to 600 pr.	200 pr. to 400 pr.	100 pr. to 200 pr.	5	6	22
16000 lb.	1200 pr. to 1800 pr.	900 pr. to 1200 pr.	600 pr. to 900 pr.	300 pr. to 400 pr.	6	7	30

Table No. 5—Depth of Pole Setting and Resulting Pole Heights

Length of Pole (Feet)	Depth of Setting In Ordinary Soil*	Height of Pole Above Ground Level	Depth of Setting In Rock*	Height of Pole above Ground Level
16	3′ 6″	12′ 6″	3′ 0″	13′ 0″
18	3′ 6″	14′ 6″	3′ 0″	15′ 0″
20	4′ 0″	16′ 0″	3′ 0″	17′ 0″
22	4′ 0″	18′ 0″	3′ 0″	19′ 0″
25	5′ 0″	20′ 0″	3′ 0″	22′ 0″
30	5′ 6″	24′ 6″	3′ 6″	26′ 6″
35	6′ 0″	29′ 0″	4′ 0″	31′ 0″
40	6′ 0″	34′ 0″	4′ 0″	36′ 0″
45	6′ 6″	38′ 6″	4′ 6″	40′ 6″
50	7′ 0″	43′ 0″	4′ 6″	45′ 6″
55	7′ 6″	47′ 5″	5′ 0″	50′ 0″
60	8′ 0″	52′ 0″	5′ 0″	55′ 0″

* Unguyed corner poles and stubs should be set at least six inches deeper than indicated in the table.



"The Small Telephone Exchange Rate Case"

This is another of the booklets issued as a service to the Independent telephone industry by The Independent Telephone Institute Inc., a company of the Gary Group. It is a book of thirty printed pages dealing with the preparation and prosecution of rate cases before Commissions or other rate making bodies by small telephone companies, and particularly by companies with fewer than 500 stations.

In the foreword the book says, "To many telephone readers, what is said in the following pages will appear to be very elementary. It is intended to be just that."

The central theme of the book is that the preparation and prosecution of a case to obtain justifiably higher rates for a small telephone exchange can and should be a relatively simple matter if the telephone company presents its case in complete and effective form so that the regulatory body can act upon the case promptly and without a disproportionate amount of investigation.

The booklet describes the principal elements of a telephone exchange rate case. Chapters dealing with these elements are *The Elements of an Exchange Rate Case*, *The Cost of Supplying the Service*, *The Exchange Revenues*, *The Rate Base* and *The Rate of Return*.

Speaking of the necessity for adequate rates at all telephone exchanges, the booklet says:

> The Independent telephone industry as a whole would be greatly strengthened if all the small companies in it were and continued to be prosperous. To achieve such prosperity it will be necessary for the small units of the industry to have good and well-kept plants, to supply good telephone service, to be in position to extend this service to meet the telephonic demands and needs of its operating territory, to be adequately financed, and to have rates for its service which will allow it, after all expense, a fair return.
>
> In many companies the starting point to most, if not all, of these things is adequate rates; no amount of efficiency of management can overcome inadequate revenues.
>
> If, to be adequate, the rates must be increased, the starting point to that is the preparation and filing of a rate case. And, as we hope this review will show, that is not nearly as difficult a job as many small telephone company managements may have thought it to be.

This book should be interesting

reading to any telephone man, and particularly those in management of small telephone exchanges. Copies of the book may be obtained without charge by addressing The Independent Telephone Institute, Inc., Room 1164, 332 South Michigan Avenue, Chicago 4, Illinois.

Joins North Electric

F. R. McBerty, president of the North Electric Manufacturing Company, Galion, O., announces that Colonel Will V. Parker, recently retired from the U. S. Army after approximately 30 years' service, all of which has been in the Signal Corps, is now associated with North Electric.

Col. W. V. Parker

Due to the nature of his service assignments in the Signal Corps, Colonel Parker is well known to the telephone industry, having spent his entire military career on communication work involving both telephone and radio facilities. Prior to his entry into the military service during World War I, he also served a number of years in the commercial telephone field.

During the entire period of World War II, Colonel Parker's assignment in the Army was that of Commanding Officer of the Plant Engineering Agency, Philadelphia, Pa., an activity under the Office of the Chief Signal Officer, in which he directed an organization of world-wide scope employing some 8,000 military and civilian personnel, and having responsibility for all classes of modern fixed communication.

He has been the recipient of numerous commendations and distinguishing awards, among which are the Purple Heart, the Silver Star, and most recently, the Distinguished Service Medal.

Colonel Parker is a native of Texas, and claims San Antonio as his permanent home.

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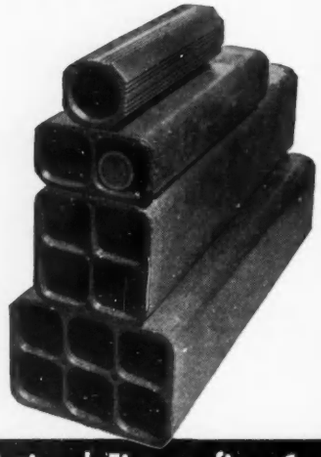

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PITTSBURGH, PA.

Better Construction for Better Service

(Continued from page 40)

Cable Repair

Cable operations which involve opening the sheath generally necessitate the work of a trained cable man as this is a specialized trade. But, linemen are often required to open a cable in order to make a temporary repair pending a later permanent repair job. Fig. 26 shows how the opening can be made in a cable and the sheath removed. A short bladed knife or a sheath splitting tool should be used in making the opening. After the sheath is removed and the paper wrapping around the core taken off, the trouble can be corrected and the core thoroughly boiled out after which the core should be wrapped with boiled out muslin strips and then temporarily taped as shown in Fig. 27. This type of repair, particularly if painted with asphalt paint, will last for many months if not years; however, a permanent repair should later be made by wiping a lead sheath over the cable opening when a cableman is available.

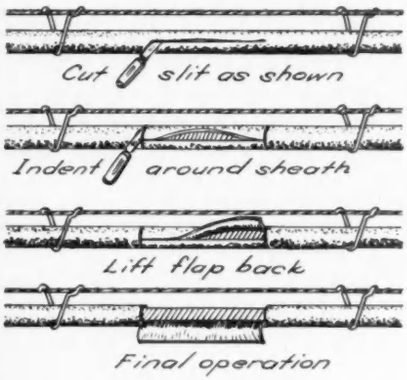

Fig. 26—Method of removing cable sheath to correct fault.

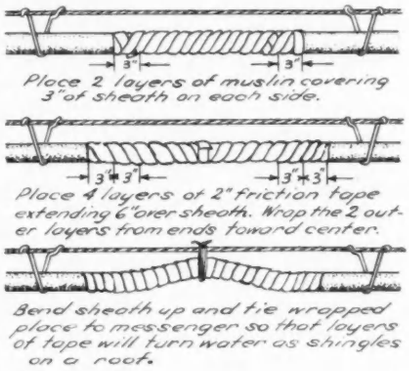
3"
Place 2 layers of muslin covering 3" of sheath on each side.
3" 3"
3" 3"
Place 4 layers of 2" friction tape extending 6" over sheath. Wrap the 2 outer layers from ends toward center.
Bend sheath up and tie wrapped place to messenger so that layers of tape will turn water as shingles on a roof.

Fig. 27—Method of closing cable sheath temporarily by means of tape until permanent repair can be made.

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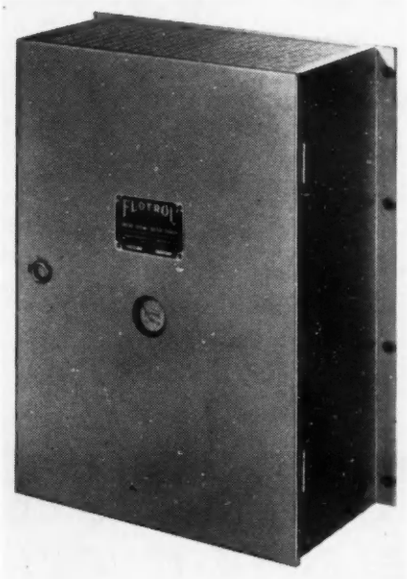
Flotrol—New Automatic Battery Charger

The Lorain Products Corporation, manufacturer of Sub-Cycle, has just announced for general distribution, Flotrol, an automatic constant voltage battery charger, which operates entirely without moving parts. Although Flotrol has just been announced generally, it has been thoroughly tested, both in the field and in the laboratory, for over two years.

Flotrol operates without moving parts and is fundamentally different from any other constant voltage battery charger on the market. Basically

it consists of an electrical phase-splitting transformer and a dry disc rectifier. With these simple elements, the Flotrol compensates for changes in input voltage and changes in load. Furthermore, it provides overload protection while operating at high power factor and high efficiency.



Flotrol, the new automatic battery charger that operates without moving parts, manufactured by Lorain Products, Lorain, Ohio.

The high efficiency of a Flotrol charger compared with other types of compensated constant voltage battery chargers assures reduced power consumption. The dual range Flotrol chargers provide for operation on any one of five different input voltage ranges: 95-115 V., 105-125 V., 190-230 V., 200-240 V., 210-250 V. Thus the most economical operating voltage can be selected for any given locality.

These same models provide for operation with either 11, 12, 22, 23, or 24 cell batteries, so that if 24 volt and 48 volt offices are operated in the same area, the same Flotrol can be adapted, by the user's maintenance men, for operation in either type of office.

Flotrol is entirely automatic—delivers correct trickle charge at all times and does not use motors, marginal relays, time delay devices, biased reactors, D. C. Stabilizers, reference voltage cells, voltage regulator tubes, or other expendable parts.

Lorain Products has prepared a very attractive and complete book, descriptive of their new Battery Charger which can be obtained by writing directly to them at Lorain, Ohio—or by addressing this publication.

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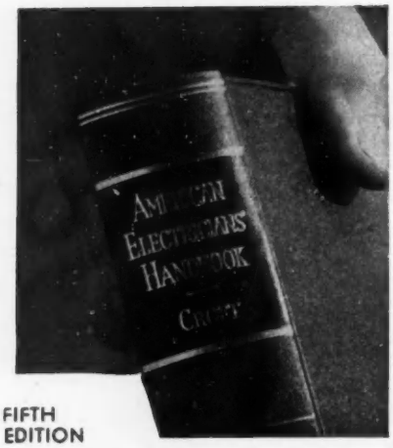

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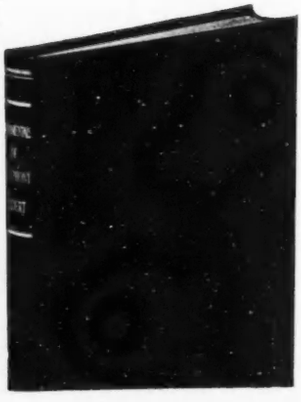

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Tokyo Calling

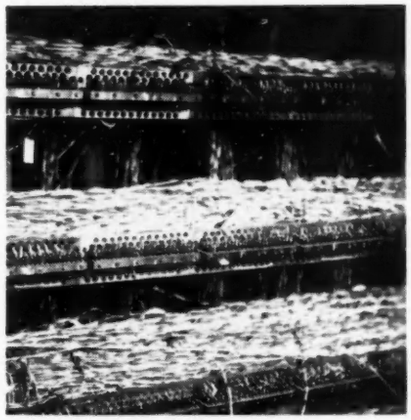
(Continued from page 44)

concrete walls, and are almost identical in appearance with the schools, post offices, and other governmental buildings. Some of the newer exchanges have an outer covering of brick veneer that gives them a cleaner and more pleasing appearance. The usual design is an L shape, with a high wall completing the other two sides to make a rectangle with an enclosed yard. Generally the power equipment, main frame and test board are on the ground floor, with the automatic equipment on the second and third floors, if a third is necessary. Some of the newer exchanges have the main frame and test board on the second floor in the equipment room.

None of the exchanges have commercial offices where bills may be paid, as all bills must be paid at the Tokyo Central Building, but each exchange has one or two rooms for records and bookkeepers. A large part of the first floor in each exchange is devoted to rooms where employees can build a small fire, in order to make tea, and to get warm during cold weather. I saw hot air heating systems in some exchanges, but none were in use in spite of temperatures below freezing. This was probably a temporary situation due to the scarcity of fuel.

The Jap methods of doing things are so different from ours that it is hard to know where to begin to describe them. Anyone familiar with the practices of this country would find it difficult to believe that anything could be accomplished the way the Japs do it, but somehow they do get things done. They have practically no tools or equipment to work with, and very little system for doing any work. You won't see any trucks with special bodies designed to facilitate construction of new lines or the installation of telephones, as they don't even use trucks at all.

I saw large cable reels being rolled through the streets by 10 men, two pushing and 8 pulling in a rope harness like the Volga boatmen. Cable splicers walk, carrying a small bag of tools, a bamboo ladder and a few bars of solder. If they are fortunate, they may have a pushcart to carry their tools and supplies in. They don't have platforms or tents, but just stand



Main frames in the Marunouchi exchange, Tokyo Central Building. Wires were run in every conceivable manner, with dead wires cut at each end and left in place. They run vertically through the horizontal or cut around the horizontal blocks from one level to another.

on the ladder or on a narrow board lashed to the messenger.

An installer may walk, or may have a bicycle, with a telephone tied behind the seat and a roll of drop wire hung on the handle bars. He isn't bothered with all of the equipment we are used to carrying: arresters, ground rods, inside wire, drop wire clamps, hooks, staples, screws, drills; none of these are used in Japan. A typical installation has the drop wire tied to the terminal pole, draped over tree limbs, run in the window and across the floor to a desk or table. The terminal block is left lying loose on the floor, usually with the cover missing; there may be 3 or 4 pigtail joints in the drop wire; there may be a dozen places that will soon wear off the insulation; in fact, the telephone may not work at all. It doesn't matter, because in most cases the new installation isn't tested before being declared complete.

According to our standards, the Japs do almost everything backwards. In order to install a telephone, the installer first goes to the new subscriber and places the instrument on a table. Then, he strings the drop wire, and upon reaching the terminal, hooks the drop to any vacant cable pair. There the installation usually rests for a day or so until the installer notifies the frame room what pair he selected, and the frame men get around to finding that pair and running a jumper. That is not as easy as it sounds, because for some unknown reason a lot of Jap cable terminals are random spliced, and although they have cable records, it is easy to get confused when dealing with a cable spliced at random.

Thus, Tokyo is the only place I have ever seen where trouble reports are received on new telephones that have not yet been completed. Many new subscribers assume the telephone is out of order after it has been on their desk for a number of days and is still dead, so they report it to the repair clerk. You can imagine the confusion of the repair clerk when he receives a report on a telephone of which he has no record and the subscriber insists that the telephone has been out of order for two or three days.

Naturally, these haphazard methods give very inefficient results. We found that of the telephones installed for the army, around 75% did not work after the order had been marked complete. Obviously these installations were never tested, as many of the troubles were simply due to missing heat coils, or the jumper on the wrong cable pair.

The Jap methods of pole line construction also emphasize how they

A section of the operators' rest room in the Koji-machi exchange where the operators lie on straw matting on the floor and use silk comforters piled in the corner for cover.

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The improved eye is drop forged on the rod as a perfectly shaped thimble and the sidewalls and groove of the eye extend all the way around the head of the rod. This keeps the strand from flattening under tension, preserves its natural roundness, and prevents it from kinking at any one point. All grooves conform, in depth and width, to the largest cable size used with each rod or guy fixture. Grooves are deeper and give better support to the guy strand.

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rely entirely upon human labor. Here again, there is a complete lack of any labor-saving device except the most elementary hand tools. Poles are hauled on horse drawn carts and set by hand. The workmen don't even have climbers or safety belts. They carry light bamboo ladders for use on poles up to about 20 feet, and above that height all poles are stepped. I saw some men use ropes for safety belts, others just sat on a crossarm, or held on with one hand and worked with the other.

Some of the Jap cable construction practices are unusual, especially their method of installing terminals. Instead of using a lead cable stub the way we do, the Japs make an insulating joint just where the lead cable enters the terminal. The wire spliced into the insulated side of the joint is rubber covered, similar to our conduit wire, and that wire is used to make the connections inside the terminal. I have already mentioned another strange feature, that a large number of Jap terminals are random spliced, so that it is hard to find the right pair without using a tone every time.

The second and concluding part of Earle B. Blomeyer's article, TOKYO CALLING, will appear in the May issue of TELEPHONE ENGINEER & MANAGEMENT.

Radio Course for Telephone Men

(Continued from page 70)

prevent oscillation except when outside excitation is applied. When the excitation pulse is applied to the first section of the tube, the interaction between the two sections of the tube causes the second section to increase the negative bias on the pulse generator tube. This causes a surge of current into blocking condenser C-1. The duration and time (position) at which the pulse takes place are controlled by adjustment of plate voltages as well as the constants of the circuits.

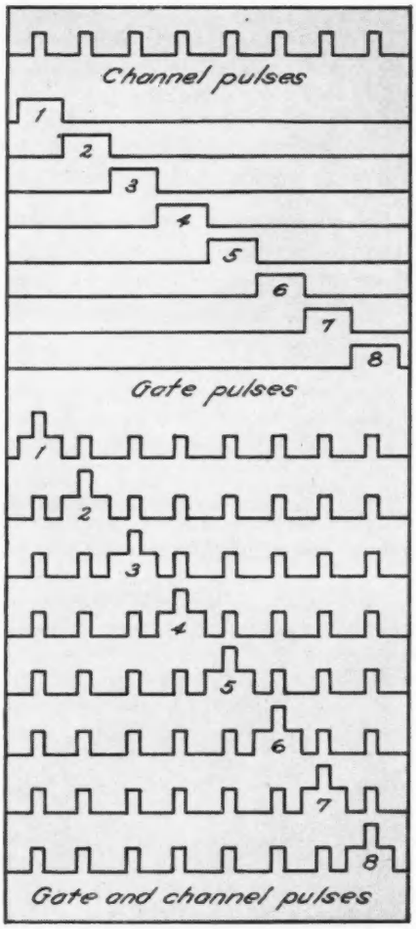

Fig. 168—Relationship between gate and channel pulses at receiver.

Modulation is accomplished by applying the voice signal to the grids of the second section of the pulse position modulator. The actual time position at which the channel pulse takes place is thus controlled by the modulating voltage. The pulse position is either retarded or advanced depending on the polarity of the voltage and its magnitude. The output pulse has essentially a square wave due to the multi-vibrator action.

The modulated channel passes into a clipper and then into a common circuit where it is mixed in time relationship

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Examination Questions

Chapter 12—Pulse Position Modulation Systems

1—What is a principal characteristic of the pulse position modulation system?

2—What are some of the advantages claimed for the pulse system over the AM and FM types?

3—Explain in a few words how voice transmission is carried by the pulse modulation technique.

4—What determines the rapidity with which the channel pulse of a PTM system deviates from its normal or unmodulated position?

5—Is the pulse position (or pulse time) modulation system economical of spectrum space?

6—What are the two basic methods of getting multichannel operation in PPM and PTM multiplex systems?

7—In the systems described in this section what is the repetition frequency of an individual channel pulse?

8—What is the purpose of the marker pulse?

9—Explain briefly the simplified operation of the eight channel PTM system.

10—What is the purpose of the gate pulse which is generated in the receiver of a PTM system?

11—Explain what is meant by the expression "position to width conversion" with respect to the PTM system.

12—Why is a 3,000 cycle low pass filter used in the output of the pulse converter circuit?

13—Explain briefly how commutator type tubes are used in the PTM system to obtain modulation and time division.

with the other channel pulses and the basic marker pulse. The built-up multichannel signal is then passed on to the high frequency oscillator causing it to send out high frequency spurts of energy corresponding to each of the marker and channel pulses. The RF output oscillator is in effect shock excited by the pulses applied to it and does not oscillate except when a pulse is applied to its input circuit.

(The PPM receiver circuit and Cyclodos and Cyclophone tubes will be discussed in the May 1 issue of FORTNIGHTLY TELEPHONE ENGINEER along with the first section of Chapter 13 of the Radio Course.)

New Aid for Hard of Hearing

A new hearing aid which climaxes 63 years of research and experience in the field of sound transmission weighs approximately six ounces. Two sensitive fingertip controls permit the wearer to select not only the proper volume, but also to tune out unwanted background sounds. The half-ounce receiver is highly efficient and was the basis of the Army-Navy light-weight headsets Full amplification, undistorted over a wide band of frequencies, is provided by three miniature electron tubes.

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Noise and Crosstalk? Keep Levels Down

(Continued from page 58)

disconnecting them and substituting coils known to be in good condition.

Method Making Transpositions

Physical transpositions can be made with either the simple drop bracket or with a 9 inch pin and two piece transposition glass. The two methods are shown in Fig. 4. Transpositions on bracket lines are arranged as shown in Fig. 5.

Special point type transpositions (see Fig. 6) are being tried out on the Selma, Alabama joint use experiments. They may have possibilities for rural and minor toll lines. These special point type transposition fixtures are somewhat simpler and cheaper than the kind ordinarily used on high grade toll circuits. Point transpositions are of particular value mainly where the power line is located relatively close (less than road width separation) to the telephone line.

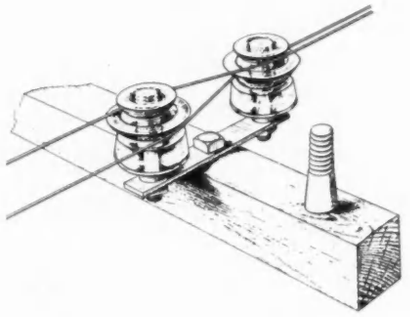

Figure 6—Type of transposition used in rural joint use experiments.

Conclusion

A telephone line is only as good as its ability to transmit voice with adequate volume and clarity. Noise and crosstalk interference tends to mask the voice and make conversation both difficult and unpleasant to the subscribers. The constantly expanding networks of rural power lines throughout the country necessitate extreme vigilance on the part of the exchange manager if rural and toll circuits are to ke kept at top operating efficiency. Periodic surveys should be made and corrective measures applied to keep noise and crosstalk to a low minimum.

Construction Costs and Plant Accounting

(Continued from page 50)

the proper charges for the various items of labor and material. On larger projects covered by specific estimates the accountant has a check on the items reported by comparison with the *authorization sheets.* By perusal of the estimate sheets he knows what items are expected to be reported under each job. If a work report is at variance with the estimate it should be investigated by the accountant to determine if such a report is correct or whether changes have been made from the original plan.

A final check is made on completion of the job by preparation of *a final completion report.* This provides a comparison of the estimated and actual expenditures under each account, assures that all expenditures and retirements have been properly reported and accounted for and provides the management with a comprehensive method of measuring the results obtained.

It will be recognized, of course, that the methods and detail to be followed must necessarily depend on the size of the individual organization. In the larger companies with specialized departments a greater amount of detail is necessary for proper

planning and authorization of the numerous projects. In the smaller company where one man perhaps plans the construction and repair projects as well as handling the accounting and commercial work, such detail is of course unnecessary. However, the necessity for proper planning and the economic selection of the best methods and accurate accounting are equally important regardless of the size of the company. The principles remain the same. The difference is only in the detail required for presentation of all facts.

Useful Tables

As previously discussed, cost studies are usually made on a *present worth* basis. Table No. 2, which gives present worth multipliers for interest rates of 3, 4, 5, 6 and 7%, will be found useful in connection with such studies. Tables 3 and 4, which give compound interest, and *present worth of an annuity* multipliers are also used in connection with cost studies.

Bartelink with General Telephone System

E. H. B. Bartelink has joined the General Telephone System as radio engineer.

Plans for the use of radio in connection with telephone service for communication with moving vehicles, isolated rural establishments and for certain toll purposes have advanced very rapidly, and Mr. Bartelink will act as advisor to all of the companies in the System, some of which already have plans actively under way, in connection with experimenting and eventually rendering service in these fields.

Mr. Bartelink is a native of Holland, a graduate of the "High School" at The Hague and holds degrees of Master of Science in Electrical Engineering from Delft University and Doctor of Philosophy from Munich University, magna cum laude.

For nearly seven years he was with the telephone system in the Netherlands, during which time he organized the long lines transmission laboratory and performed research work on high speed telegraph transmission on telephone lines and on telephone privacy equipment and had extensive experience in the operation of the system. He was later in charge of the technical equipment of the Amsterdam toll office which includes the terminal equipment for the radio link with the Netherlands East Indies and the toll lines to other European countries.

He came to the United States early in 1937 and was with the research laboratory of the General Electric Company in various investigations having to do with radio and electronic developments, including research in multiple pulsed radio transmission, combining picture and sound transmission on the same carrier, etc., and was subsequently in charge of a group doing system research in radar and various other matters of a wartime nature. From August, 1934 until he left to join the General Telephone System he was working for the government (NDRC) in its Radiation Laboratory at Massachusetts Institute of Technology. He holds some Netherlands patents and has about twenty-five pending applications in this country.

Mr. Bartelink will have his headquarters at the company's offices in New York at 80 Broad Street.

Postpones Hearings

The Public Service Commission of Utah has granted the request of the Mountain States Tel. & Tel. Co. to postpone hearings until they can prepare separation studies to be used in connection with their contention that any reduction in intrastate toll rates would be confiscatory of Mt. Tel.'s properties in Utah. The hearings are now to begin May 13, 1946.

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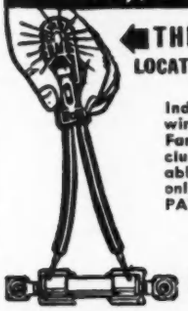

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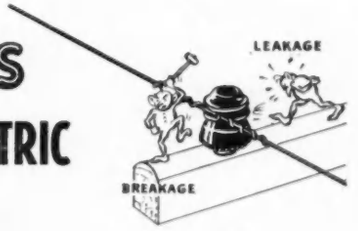

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WANTED: DISTRICT MANAGER—By large telephone company operating in Kentucky and Tennessee. Excellent opportunity for man having necessary qualifications. Please furnish information as to age, education, experience, references, salary expected, and present employment in first inquiry. Reply to Box 8430, c/o TELEPHONE ENGINEER.

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Veterans to Enter Rural Construction

Richard Farrell and R. Taylor, veterans who have been working with one of the Northwestern Bell Telephone Company's line construction crews in order to gain practical experience in rural line construction, plan to purchase a light construction truck and do rural line construction work on a contract basis.

Anyone wishing to contact them is invited to write Richard Farrell, c/o H. L. Bush, Garner, Iowa.

Rates Increased

The Golden (Ill.) Farmers Telephone Company have increased their rates with permission of the Illinois Commerce Commission as follows:

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Extension	stations	2	6.00	9.00
Switching	service	259	3.00	4.50

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The latest edition of the National Bureau of Standards Handbook, H-40, containing the provisions of the "Code of Protection Against Lightning," is now available to anyone sending 20c to the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

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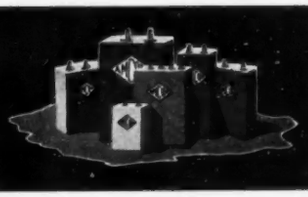

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